SEQUENCE LISTING

<110> Duvick, Jonathan P.
      Gilliam, Jacob T.
      Maddox, Joyce R.
      Rao,Aragula Gururaj
      Crasta, Oswald R.
      Folkerts, Otto

<120> Amino Polyol Amine Oxidase
   Polynucleotides and Related Polypeptides and Methods of Use

<130> 1134D

<150> US 60/092,936
<151> 1998-07-25

<150> US 60/135,391
<151> 1999-05-21

<150> US 09/352,159
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attgtcgatc gacgtcgatg ctggtatctc tggcaaatga gatggggtca cagctcgatt   180
ggaggacgcc cgagaagcct tgttcgcgcc accacggctt gtcccatacg aagactatct   240
tgctatagta gcccaggata gaattttccg ccaatgcttg cttctcggcg ggaagaggtg   300
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tacaaggttg tcggtaacga aaccaccacc tttttgcttc ggaacacggc gcccgaggcc   120
gatcgtactg tacagccgga tgccgactgc tcaatttcag cgacgggggt gttgaggtgc   180
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        <220>
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tggtttcgtt accgacaacc ttgtatccc   29

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gagttggtcc cagacagact tttgtcgt   28

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gac aac gtt gcg gac gtg gta gtg gtg ggc gct ggc ttg agc ggt ttg   48
Asp Asn Val Ala Asp Val Val Val Val Gly Ala Gly Leu Ser Gly Leu
 1   5   10   15

gag acg gca cgc aaa gtc cag gcc gcc ggt ctg tcc tgc ctc gtt ctt   96
Glu Thr Ala Arg Lys Val Gln Ala Ala Gly Leu Ser Cys Leu Val Leu
                20   25   30

gag gcg atg gat cgt gta ggg gga aag act ctg agc gta caa tcg ggt   144
Glu Ala Met Asp Arg Val Gly Gly Lys Thr Leu Ser Val Gln Ser Gly
            35   40   45

ccc ggc agg acg act atc aac gac ctc ggc gct gcg tgg atc aat gac   192
Pro Gly Arg Thr Thr Ile Asn Asp Leu Gly Ala Ala Trp Ile Asn Asp
    50   55   60

agc aac caa agc gaa gta tcc aga ttg ttt gaa aga ttt cat ttg gag   240
Ser Asn Gln Ser Glu Val Ser Arg Leu Phe Glu Arg Phe His Leu Glu

2

ggc gag ctc cag agg acg act gga aat tca atc cat caa gca caa gac   288
Gly Glu Leu Gln Arg Thr Thr Gly Asn Ser Ile His Gln Ala Gln Asp
                85   90   95

ggt aca acc act aca gct cct tat ggt gac tcc ttg ctg agc gag gag   336
Gly Thr Thr Thr Thr Ala Pro Tyr Gly Asp Ser Leu Leu Ser Glu Glu
            100   105   110

gtt gca agt gca ctt gcg gaa ctc ctc ccc gta tgg tct cag ctg atc   384
Val Ala Ser Ala Leu Ala Glu Leu Leu Pro Val Trp Ser Gln Leu Ile
            115   120   125

gaa gag cat agc ctt caa gac ctc aag gcg agc cct cag gcg aag cgg   432
Glu Glu His Ser Leu Gln Asp Leu Lys Ala Ser Pro Gln Ala Lys Arg
            130   135   140

ctc gac agt gtg agc ttc gcg cac tac tgt gag aag gaa cta aac ttg   480
Leu Asp Ser Val Ser Phe Ala His Tyr Cys Glu Lys Glu Leu Asn Leu
145   150   155   160

cct gct gtt ctc ggc gta gca aac cag atc aca cgc gct ctg ctc ggt   528
Pro Ala Val Leu Gly Val Ala Asn Gln Ile Thr Arg Ala Leu Leu Gly
                165   170   175

gtg gaa gcc cac gag atc agc atg ctt ttt ctc acc gac tac atc aag   576
Val Glu Ala His Glu Ile Ser Met Leu Phe Leu Thr Asp Tyr Ile Lys
            180   185   190

agt gcc acc ggt ctc agt aat att ttc tcg gac aag aaa gac ggc ggg   624
Ser Ala Thr Gly Leu Ser Asn Ile Phe Ser Asp Lys Lys Asp Gly Gly
            195   200   205

cag tat atg cga tgc aaa aca ggt atg cag tcg att tgc cat gcc atg   672
Gln Tyr Met Arg Cys Lys Thr Gly Met Gln Ser Ile Cys His Ala Met
            210   215   220

tca aag gaa ctt gtt cca ggc tca gtg cac ctc aac acc ccc gtc gct   720
Ser Lys Glu Leu Val Pro Gly Ser Val His Leu Asn Thr Pro Val Ala
225   230   235   240

gaa att gag cag tcg gca tcc ggc tgt aca gta cga tcg gcc tcg ggc   768
Glu Ile Glu Gln Ser Ala Ser Gly Cys Thr Val Arg Ser Ala Ser Gly
            245   250   255

gcc gtg ttc cga agc aaa aag gtg gtg gtt tcg tta ccg aca acc ttg   816
Ala Val Phe Arg Ser Lys Lys Val Val Val Ser Leu Pro Thr Thr Leu
            260   265   270

tat ccc acc ttg aca ttt tca cca cct ctt ccc gcc gag aag caa gca   864
Tyr Pro Thr Leu Thr Phe Ser Pro Pro Leu Pro Ala Glu Lys Gln Ala
            275   280   285

ttg gcg gaa aat tct atc ctg ggc tac tat agc aag ata gtc ttc gta   912
Leu Ala Glu Asn Ser Ile Leu Gly Tyr Tyr Ser Lys Ile Val Phe Val
            290   295   300

3

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tgg gac aag ccg tgg tgg cgc gaa caa ggc ttc tcg ggc gtc ctc caa      960
Trp Asp Lys Pro Trp Trp Arg Glu Gln Gly Phe Ser Gly Val Leu Gln
305             310             315             320

tcg agc tgt gac ccc atc tca ttt gcc aga gat acc agc atc gac gtc     1008
Ser Ser Cys Asp Pro Ile Ser Phe Ala Arg Asp Thr Ser Ile Asp Val
                325             330             335

gat cga caa tgg tcc att acc tgt ttc atg gtc gga gac ccg gga cgg     1056
Asp Arg Gln Trp Ser Ile Thr Cys Phe Met Val Gly Asp Pro Gly Arg
                340             345             350

aag tgg tcc caa cag tcc aag cag gta cga caa aag tct gtc tgg gac     1104
Lys Trp Ser Gln Gln Ser Lys Gln Val Arg Gln Lys Ser Val Trp Asp
            355             360             365

caa ctc cgc gca gcc tac gag aac gcc ggg gcc caa gtc cca gag ccg     1152
Gln Leu Arg Ala Ala Tyr Glu Asn Ala Gly Ala Gln Val Pro Glu Pro
        370             375             380

gcc aac gtg ctc gaa atc gag tgg tcg aag cag cag tat ttc caa gga     1200
Ala Asn Val Leu Glu Ile Glu Trp Ser Lys Gln Gln Tyr Phe Gln Gly
385             390             395             400

gct ccg agc gcc gtc tat ggg ctg aac gat ctc atc aca ctg ggt tcg     1248
Ala Pro Ser Ala Val Tyr Gly Leu Asn Asp Leu Ile Thr Leu Gly Ser
                405             410             415

gcg ctc aga acg ccg ttc aag agt gtt cat ttc gtt gga acg gag acg     1296
Ala Leu Arg Thr Pro Phe Lys Ser Val His Phe Val Gly Thr Glu Thr
                420             425             430

tct tta gtt tgg aaa ggg tat atg gaa ggg gcc ata cga tcg ggt caa     1344
Ser Leu Val Trp Lys Gly Tyr Met Glu Gly Ala Ile Arg Ser Gly Gln
                435             440             445

cga ggt gct gca gaa gtt gtg gct agc ctg gtg cca gca gca            1386
Arg Gly Ala Ala Glu Val Val Ala Ser Leu Val Pro Ala Ala
        450             455             460

tag                                                                 1389


        <210> 6
        <211> 462
        <212> PRT
        <213> Exophiala spinifera

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Glu Thr Ala Arg Lys Val Gln Ala Ala Gly Leu Ser Cys Leu Val Leu
            20              25              30
Glu Ala Met Asp Arg Val Gly Gly Lys Thr Leu Ser Val Gln Ser Gly
        35              40              45
Pro Gly Arg Thr Thr Ile Asn Asp Leu Gly Ala Ala Trp Ile Asn Asp
    50              55              60
Ser Asn Gln Ser Glu Val Ser Arg Leu Phe Glu Arg Phe His Leu Glu
65              70              75              80
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4

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Gly Glu Leu Gln Arg Thr Thr Gly Asn Ser Ile His Gln Ala Gln Asp
                85                  90                  95
Gly Thr Thr Thr Thr Ala Pro Tyr Gly Asp Ser Leu Leu Ser Glu Glu
            100                 105                 110
Val Ala Ser Ala Leu Ala Glu Leu Leu Pro Val Trp Ser Gln Leu Ile
            115                 120                 125
Glu Glu His Ser Leu Gln Asp Leu Lys Ala Ser Pro Gln Ala Lys Arg
            130                 135                 140
Leu Asp Ser Val Ser Phe Ala His Tyr Cys Glu Lys Glu Leu Asn Leu
145                 150                 155                 160
Pro Ala Val Leu Gly Val Ala Asn Gln Ile Thr Arg Ala Leu Leu Gly
                165                 170                 175
Val Glu Ala His Glu Ile Ser Met Leu Phe Leu Thr Asp Tyr Ile Lys
            180                 185                 190
Ser Ala Thr Gly Leu Ser Asn Ile Phe Ser Asp Lys Lys Asp Gly Gly
            195                 200                 205
Gln Tyr Met Arg Cys Lys Thr Gly Met Gln Ser Ile Cys His Ala Met
    210                 215                 220
Ser Lys Glu Leu Val Pro Gly Ser Val His Leu Asn Thr Pro Val Ala
225                 230                 235                 240
Glu Ile Glu Gln Ser Ala Ser Gly Cys Thr Val Arg Ser Ala Ser Gly
                245                 250                 255
Ala Val Phe Arg Ser Lys Lys Val Val Val Ser Leu Pro Thr Thr Leu
                260                 265                 270
Tyr Pro Thr Leu Thr Phe Ser Pro Pro Leu Pro Ala Glu Lys Gln Ala
            275                 280                 285
Leu Ala Glu Asn Ser Ile Leu Gly Tyr Tyr Ser Lys Ile Val Phe Val
            290                 295                 300
Trp Asp Lys Pro Trp Trp Arg Glu Gln Gly Phe Ser Gly Val Leu Gln
305                 310                 315                 320
Ser Ser Cys Asp Pro Ile Ser Phe Ala Arg Asp Thr Ser Ile Asp Val
                325                 330                 335
Asp Arg Gln Trp Ser Ile Thr Cys Phe Met Val Gly Asp Pro Gly Arg
            340                 345                 350
Lys Trp Ser Gln Gln Ser Lys Gln Val Arg Gln Lys Ser Val Trp Asp
            355                 360                 365
Gln Leu Arg Ala Ala Tyr Glu Asn Ala Gly Ala Gln Val Pro Glu Pro
            370                 375                 380
Ala Asn Val Leu Glu Ile Glu Trp Ser Lys Gln Gln Tyr Phe Gln Gly
385                 390                 395                 400
Ala Pro Ser Ala Val Tyr Gly Leu Asn Asp Leu Ile Thr Leu Gly Ser
                405                 410                 415
Ala Leu Arg Thr Pro Phe Lys Ser Val His Phe Val Gly Thr Glu Thr
            420                 425                 430
Ser Leu Val Trp Lys Gly Tyr Met Glu Gly Ala Ile Arg Ser Gly Gln
            435                 440                 445
Arg Gly Ala Ala Glu Val Val Ala Ser Leu Val Pro Ala Ala
    450                 455                 460

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        <213> Exophiala spinifera

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Asp Asn Val Ala Asp Val Val Val Val Gly Ala Gly Leu Ser Gly Leu
 1   5   10   15

gag acg gca cgc aaa gtc cag gcc gcc ggt ctg tcc tgc ctc gtt ctt   96
Glu Thr Ala Arg Lys Val Gln Ala Ala Gly Leu Ser Cys Leu Val Leu
            20   25   30

gag gcg atg gat cgt gta ggg gga aag act ctg agc gta caa tcg ggt   144
Glu Ala Met Asp Arg Val Gly Gly Lys Thr Leu Ser Val Gln Ser Gly
        35   40   45

ccc ggc agg acg act atc aac gac ctc ggc gct gcg tgg atc aat gac   192
Pro Gly Arg Thr Thr Ile Asn Asp Leu Gly Ala Ala Trp Ile Asn Asp
    50   55   60

agc aac caa agc gaa gta tcc aga ttg ttt gaa aga ttt cat ttg gag   240
Ser Asn Gln Ser Glu Val Ser Arg Leu Phe Glu Arg Phe His Leu Glu
 65   70   75   80

ggc gag ctc cag agg acg act gga aat tca atc cat caa gca caa gac   288
Gly Glu Leu Gln Arg Thr Thr Gly Asn Ser Ile His Gln Ala Gln Asp
                85   90   95

ggt aca acc act aca gct cct tat ggt gac tcc ttg ctg agc gag gag   336
Gly Thr Thr Thr Thr Ala Pro Tyr Gly Asp Ser Leu Leu Ser Glu Glu
            100   105   110

gtt gca agt gca ctt gcg gaa ctc ctc ccc gta tgg tct cag ctg atc   384
Val Ala Ser Ala Leu Ala Glu Leu Leu Pro Val Trp Ser Gln Leu Ile
        115   120   125

gaa gag cat agc ctt caa gac ctc aag gcg agc cct cag gcg aag cgg   432
Glu Glu His Ser Leu Gln Asp Leu Lys Ala Ser Pro Gln Ala Lys Arg
    130   135   140

ctc gac agt gtg agc ttc gcg cac tac tgt gag aag gaa cta aac ttg   480
Leu Asp Ser Val Ser Phe Ala His Tyr Cys Glu Lys Glu Leu Asn Leu
145   150   155   160

cct gct gtt ctc ggc gta gca aac cag atc aca cgc gct ctg ctc ggt   528
Pro Ala Val Leu Gly Val Ala Asn Gln Ile Thr Arg Ala Leu Leu Gly
                165   170   175

gtg gaa gcc cac gag atc agc atg ctt ttt ctc acc gac tac atc aag   576
Val Glu Ala His Glu Ile Ser Met Leu Phe Leu Thr Asp Tyr Ile Lys
            180   185   190

agt gcc acc ggt ctc agt aat att ttc tcg gac aag aaa gac ggc ggg   624
Ser Ala Thr Gly Leu Ser Asn Ile Phe Ser Asp Lys Lys Asp Gly Gly
        195   200   205

6

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cag tat gtg cga tgc aaa aca g gtgcgtgtgg tgtcgtctca ggtgggggac        676
Gln Tyr Val Arg Cys Lys Thr
    210             215


tcgtttctca gtggtcattc cag gt atg cag tcg att tgc cat gcc atg tca      728
                          Gly Met Gln Ser Ile Cys His Ala Met Ser
                                      220                 225


aag gaa ctt gtt cca ggc tca gtg cac ctc aac acc ccc gtc gct gaa      776
Lys Glu Leu Val Pro Gly Ser Val His Leu Asn Thr Pro Val Ala Glu
                230                 235             240


att gag cag tcg gca tcc ggc tgt aca gta cga tcg gcc tcg ggc gcc      824
Ile Glu Gln Ser Ala Ser Gly Cys Thr Val Arg Ser Ala Ser Gly Ala
                245                 250             255


gtg ttc cga agc aaa aag gtg gtg gtt tcg tta ccg aca acc ttg tat      872
Val Phe Arg Ser Lys Lys Val Val Val Ser Leu Pro Thr Thr Leu Tyr
            260                 265             270


ccc acc ttg aca ttt tca cca cct ctt ccc gcc gag aag caa gca ttg      920
Pro Thr Leu Thr Phe Ser Pro Pro Leu Pro Ala Glu Lys Gln Ala Leu
        275                 280                 285


gcg gaa aat tct atc ctg ggc tac tat agc aag ata gtc ttc gta tgg      968
Ala Glu Asn Ser Ile Leu Gly Tyr Tyr Ser Lys Ile Val Phe Val Trp
290                 295                 300                 305


gac aag ccg tgg tgg cgc gaa caa ggc ttc tcg ggc gtc ctc caa tcg     1016
Asp Lys Pro Trp Trp Arg Glu Gln Gly Phe Ser Gly Val Leu Gln Ser
            310                 315                 320


agc tgt gac ccc atc tca ttt gcc aga gat acc agc atc gac gtc gat     1064
Ser Cys Asp Pro Ile Ser Phe Ala Arg Asp Thr Ser Ile Asp Val Asp
            325                 330                 335


cga caa tgg tcc att acc tgt ttc atg gtc gga gac ccg gga cgg aag     1112
Arg Gln Trp Ser Ile Thr Cys Phe Met Val Gly Asp Pro Gly Arg Lys
            340                 345                 350


tgg tcc caa cag tcc aag cag gta cga caa aag tct gtc tgg gac caa     1160
Trp Ser Gln Gln Ser Lys Gln Val Arg Gln Lys Ser Val Trp Asp Gln
    355                 360                 365


ctc cgc gca gcc tac gag aac gcc ggg gcc caa gtc cca gag ccg gcc     1208
Leu Arg Ala Ala Tyr Glu Asn Ala Gly Ala Gln Val Pro Glu Pro Ala
370                 375                 380                 385


aac gtg ctc gaa atc gag tgg tcg aag cag cag tat ttc caa gga gct     1256
Asn Val Leu Glu Ile Glu Trp Ser Lys Gln Gln Tyr Phe Gln Gly Ala
                390                 395                 400


ccg agc gcc gtc tat ggg ctg aac gat ctc atc aca ctg ggt tcg gcg     1304
Pro Ser Ala Val Tyr Gly Leu Asn Asp Leu Ile Thr Leu Gly Ser Ala
                405                 410                 415


ctc aga acg ccg ttc aag agt gtt cat ttc gtt gga acg gag acg tct     1352
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Leu Arg Thr Pro Phe Lys Ser Val His Phe Val Gly Thr Glu Thr Ser
        420             425             430

tta gtt tgg aaa ggg tat atg gaa ggg gcc ata cga tcg ggt caa cga      1400
Leu Val Trp Lys Gly Tyr Met Glu Gly Ala Ile Arg Ser Gly Gln Arg
        435             440             445

ggt gct gca gaa gtt gtg gct agc ctg gtg cca gca gca tag            1442
Gly Ala Ala Glu Val Val Ala Ser Leu Val Pro Ala Ala
450             455             460


        <210> 8
        <211> 462
        <212> PRT
        <213> Exophiala spinifera

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Asp Asn Val Ala Asp Val Val Val Val Gly Ala Gly Leu Ser Gly Leu
 1               5               10              15
Glu Thr Ala Arg Lys Val Gln Ala Ala Gly Leu Ser Cys Leu Val Leu
        20              25              30
Glu Ala Met Asp Arg Val Gly Gly Lys Thr Leu Ser Val Gln Ser Gly
        35              40              45
Pro Gly Arg Thr Thr Ile Asn Asp Leu Gly Ala Ala Trp Ile Asn Asp
        50              55              60
Ser Asn Gln Ser Glu Val Ser Arg Leu Phe Glu Arg Phe His Leu Glu
65              70              75              80
Gly Glu Leu Gln Arg Thr Thr Gly Asn Ser Ile His Gln Ala Gln Asp
                85              90              95
Gly Thr Thr Thr Thr Ala Pro Tyr Gly Asp Ser Leu Leu Ser Glu Glu
        100             105             110
Val Ala Ser Ala Leu Ala Glu Leu Leu Pro Val Trp Ser Gln Leu Ile
        115             120             125
Glu Glu His Ser Leu Gln Asp Leu Lys Ala Ser Pro Gln Ala Lys Arg
        130             135             140
Leu Asp Ser Val Ser Phe Ala His Tyr Cys Glu Lys Glu Leu Asn Leu
145             150             155             160
Pro Ala Val Leu Gly Val Ala Asn Gln Ile Thr Arg Ala Leu Leu Gly
                165             170             175
Val Glu Ala His Glu Ile Ser Met Leu Phe Leu Thr Asp Tyr Ile Lys
        180             185             190
Ser Ala Thr Gly Leu Ser Asn Ile Phe Ser Asp Lys Lys Asp Gly Gly
        195             200             205
Gln Tyr Val Arg Cys Lys Thr Gly Met Gln Ser Ile Cys His Ala Met
        210             215             220
Ser Lys Glu Leu Val Pro Gly Ser Val His Leu Asn Thr Pro Val Ala
225             230             235             240
Glu Ile Glu Gln Ser Ala Ser Gly Cys Thr Val Arg Ser Ala Ser Gly
                245             250             255
Ala Val Phe Arg Ser Lys Lys Val Val Val Ser Leu Pro Thr Thr Leu
                260             265             270
Tyr Pro Thr Leu Thr Phe Ser Pro Pro Leu Pro Ala Glu Lys Gln Ala
        275             280             285
Leu Ala Glu Asn Ser Ile Leu Gly Tyr Tyr Ser Lys Ile Val Phe Val
        290             295             300
Trp Asp Lys Pro Trp Trp Arg Glu Gln Gly Phe Ser Gly Val Leu Gln
305             310             315             320
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Ser Ser Cys Asp Pro Ile Ser Phe Ala Arg Asp Thr Ser Ile Asp Val
            325                 330                 335
Asp Arg Gln Trp Ser Ile Thr Cys Phe Met Val Gly Asp Pro Gly Arg
            340                 345                 350
Lys Trp Ser Gln Gln Ser Lys Gln Val Arg Gln Lys Ser Val Trp Asp
            355                 360                 365
Gln Leu Arg Ala Ala Tyr Glu Asn Ala Gly Ala Gln Val Pro Glu Pro
    370                 375                 380
Ala Asn Val Leu Glu Ile Glu Trp Ser Lys Gln Gln Tyr Phe Gln Gly
385                 390                 395                 400
Ala Pro Ser Ala Val Tyr Gly Leu Asn Asp Leu Ile Thr Leu Gly Ser
            405                 410                 415
Ala Leu Arg Thr Pro Phe Lys Ser Val His Phe Val Gly Thr Glu Thr
            420                 425                 430
Ser Leu Val Trp Lys Gly Tyr Met Glu Gly Ala Ile Arg Ser Gly Gln
            435                 440                 445
Arg Gly Ala Ala Glu Val Val Ala Ser Leu Val Pro Ala Ala
    450                 455                 460
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        <211> 458
        <212> PRT
        <213> Exophiala spinifera

        <400> 9
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            20                  25                  30
Glu Ala Met Asp Arg Val Gly Gly Lys Thr Leu Ser Val Gln Ser Gly
            35                  40                  45
Pro Gly Arg Thr Thr Ile Asn Asp Leu Gly Ala Ala Trp Ile Asn Asp
    50                  55                  60
Ser Asn Gln Ser Glu Val Ser Arg Leu Phe Glu Arg Phe His Leu Glu
65                  70                  75                  80
Gly Glu Leu Gln Arg Thr Thr Gly Asn Ser Ile His Gln Ala Gln Asp
            85                  90                  95
Gly Thr Thr Thr Thr Ala Pro Tyr Gly Asp Ser Leu Leu Ser Glu Glu
            100                 105                 110
Val Ala Ser Ala Leu Ala Glu Leu Leu Pro Val Trp Ser Gln Leu Ile
            115                 120                 125
Glu Glu His Ser Leu Gln Asp Leu Lys Ala Ser Pro Gln Ala Lys Arg
    130                 135                 140
Leu Asp Ser Val Ser Phe Ala His Tyr Cys Glu Lys Glu Leu Asn Leu
145                 150                 155                 160
Pro Ala Val Leu Gly Val Ala Asn Gln Ile Thr Arg Ala Leu Leu Gly
            165                 170                 175
Val Glu Ala His Glu Ile Ser Met Leu Phe Leu Thr Asp Tyr Ile Lys
            180                 185                 190
Ser Ala Thr Gly Leu Ser Asn Ile Phe Ser Asp Lys Lys Asp Gly Gly
            195                 200                 205
Gln Tyr Val Arg Cys Lys Thr Gly Ala Cys Gly Val Val Ser Gly Gly
    210                 215                 220
Gly Leu Val Ser Gln Trp Ser Phe Gln Val Cys Ser Arg Phe Ala Met
225                 230                 235                 240
Pro Cys Gln Arg Asn Leu Phe Gln Ala Gln Cys Thr Ser Thr Pro Pro
            245                 250                 255
Ser Leu Lys Leu Ser Ser Arg His Pro Ala Val Gln Tyr Asp Arg Pro
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                                    9

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                260                        265                        270
Arg Ala Pro Cys Ser Glu Ala Lys Arg Trp Trp Phe Arg Tyr Arg Gln
        275                        280                        285
Pro Cys Ile Pro Pro His Phe His His Leu Phe Pro Pro Arg Ser Lys
    290                        295                        300
His Trp Arg Lys Ile Leu Ser Trp Ala Thr Ile Ala Arg Ser Ser Tyr
305                        310                        315                        320
Gly Thr Ser Arg Gly Gly Ala Asn Lys Ala Ser Arg Ala Ser Ser Asn
                325                        330                        335
Arg Ala Val Thr Pro Ser His Leu Pro Glu Ile Pro Ala Ser Thr Ser
                340                        345                        350
Ile Asp Asn Gly Pro Leu Pro Val Ser Trp Ser Glu Thr Arg Asp Gly
            355                        360                        365
Ser Gly Pro Asn Ser Pro Ser Arg Tyr Asp Lys Ser Leu Ser Gly Thr
    370                        375                        380
Asn Ser Ala Gln Pro Thr Arg Thr Pro Gly Pro Lys Ser Gln Ser Arg
385                        390                        395                        400
Pro Thr Cys Ser Lys Ser Ser Gly Arg Ser Ser Ser Ile Ser Lys Glu
                405                        410                        415
Leu Arg Ala Pro Ser Met Gly Thr Ile Ser Ser His Trp Val Arg Arg
            420                        425                        430
Ser Glu Arg Arg Ser Arg Val Phe Ile Ser Leu Glu Arg Arg Arg Leu
            435                        440                        445
Phe Gly Lys Gly Ile Trp Lys Gly Pro Tyr
    450                        455

        <210> 10
        <211> 1392
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        <213> Exophiala spinifera

        <220>
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        <221> misc_feature
        <222> (1)...(3)
        <223> Extra lysine in K:trAPAO

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aaa gac aac gtt gcg gac gtg gta gtg gtg ggc gct ggc ttg agc ggt        48
Lys Asp Asn Val Ala Asp Val Val Val Val Gly Ala Gly Leu Ser Gly
 1               5                       10                      15

ttg gag acg gca cgc aaa gtc cag gcc gcc ggt ctg tcc tgc ctc gtt        96
Leu Glu Thr Ala Arg Lys Val Gln Ala Ala Gly Leu Ser Cys Leu Val
                20                      25                      30

ctt gag gcg atg gat cgt gta ggg gga aag act ctg agc gta caa tcg       144
Leu Glu Ala Met Asp Arg Val Gly Gly Lys Thr Leu Ser Val Gln Ser
            35                      40                      45

ggt ccc ggc agg acg act atc aac gac ctc ggc gct gcg tgg atc aat       192
Gly Pro Gly Arg Thr Thr Ile Asn Asp Leu Gly Ala Ala Trp Ile Asn
    50                      55                      60

gac agc aac caa agc gaa gta tcc aga ttg ttt gaa aga ttt cat ttg       240
Asp Ser Asn Gln Ser Glu Val Ser Arg Leu Phe Glu Arg Phe His Leu
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10

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gag ggc gag ctc cag agg acg act gga aat tca atc cat caa gca caa      288
Glu Gly Glu Leu Gln Arg Thr Thr Gly Asn Ser Ile His Gln Ala Gln
                85                  90                  95

gac ggt aca acc act aca gct cct tat ggt gac tcc ttg ctg agc gag      336
Asp Gly Thr Thr Thr Thr Ala Pro Tyr Gly Asp Ser Leu Leu Ser Glu
            100                 105                 110

gag gtt gca agt gca ctt gcg gaa ctc ctc ccc gta tgg tct cag ctg      384
Glu Val Ala Ser Ala Leu Ala Glu Leu Leu Pro Val Trp Ser Gln Leu
            115                 120                 125

atc gaa gag cat agc ctt caa gac ctc aag gcg agc cct cag gcg aag      432
Ile Glu Glu His Ser Leu Gln Asp Leu Lys Ala Ser Pro Gln Ala Lys
    130                 135                 140

cgg ctc gac agt gtg agc ttc gcg cac tac tgt gag aag gaa cta aac      480
Arg Leu Asp Ser Val Ser Phe Ala His Tyr Cys Glu Lys Glu Leu Asn
145                 150                 155                 160

ttg cct gct gtt ctc ggc gta gca aac cag atc aca cgc gct ctg ctc      528
Leu Pro Ala Val Leu Gly Val Ala Asn Gln Ile Thr Arg Ala Leu Leu
                165                 170                 175

ggt gtg gaa gcc cac gag atc agc atg ctt ttt ctc acc gac tac atc      576
Gly Val Glu Ala His Glu Ile Ser Met Leu Phe Leu Thr Asp Tyr Ile
            180                 185                 190

aag agt gcc acc ggt ctc agt aat att ttc tcg gac aag aaa gac ggc      624
Lys Ser Ala Thr Gly Leu Ser Asn Ile Phe Ser Asp Lys Lys Asp Gly
            195                 200                 205


ggg cag tat atg cga tgc aaa aca ggt atg cag tcg att tgc cat gcc      672
Gly Gln Tyr Met Arg Cys Lys Thr Gly Met Gln Ser Ile Cys His Ala
    210                 215                 220

atg tca aag gaa ctt gtt cca ggc tca gtg cac ctc aac acc ccc gtc      720
Met Ser Lys Glu Leu Val Pro Gly Ser Val His Leu Asn Thr Pro Val
225                 230                 235                 240

gct gaa att gag cag tcg gca tcc ggc tgt aca gta cga tcg gcc tcg      768
Ala Glu Ile Glu Gln Ser Ala Ser Gly Cys Thr Val Arg Ser Ala Ser
            245                 250                 255

ggc gcc gtg ttc cga agc aaa aag gtg gtg gtt tcg tta ccg aca acc      816
Gly Ala Val Phe Arg Ser Lys Lys Val Val Val Ser Leu Pro Thr Thr
            260                 265                 270

ttg tat ccc acc ttg aca ttt tca cca cct ctt ccc gcc gag aag caa      864
Leu Tyr Pro Thr Leu Thr Phe Ser Pro Pro Leu Pro Ala Glu Lys Gln
            275                 280                 285

gca ttg gcg gaa aat tct atc ctg ggc tac tat agc aag ata gtc ttc      912
Ala Leu Ala Glu Asn Ser Ile Leu Gly Tyr Tyr Ser Lys Ile Val Phe
    290                 295                 300
```

11

```
gta tgg gac aag ccg tgg tgg cgc gaa caa ggc ttc tcg ggc gtc ctc        960
Val Trp Asp Lys Pro Trp Trp Arg Glu Gln Gly Phe Ser Gly Val Leu
305             310             315             320

caa tcg agc tgt gac ccc atc tca ttt gcc aga gat acc agc atc gac       1008
Gln Ser Ser Cys Asp Pro Ile Ser Phe Ala Arg Asp Thr Ser Ile Asp
                325             330             335

gtc gat cga caa tgg tcc att acc tgt ttc atg gtc gga gac ccg gga       1056
Val Asp Arg Gln Trp Ser Ile Thr Cys Phe Met Val Gly Asp Pro Gly
                340             345             350

cgg aag tgg tcc caa cag tcc aag cag gta cga caa aag tct gtc tgg       1104
Arg Lys Trp Ser Gln Gln Ser Lys Gln Val Arg Gln Lys Ser Val Trp
                355             360             365

gac caa ctc cgc gca gcc tac gag aac gcc ggg gcc caa gtc cca gag       1152
Asp Gln Leu Arg Ala Ala Tyr Glu Asn Ala Gly Ala Gln Val Pro Glu
        370             375             380

ccg gcc aac gtg ctc gaa atc gag tgg tcg aag cag cag tat ttc caa       1200
Pro Ala Asn Val Leu Glu Ile Glu Trp Ser Lys Gln Gln Tyr Phe Gln
385             390             395             400

gga gct ccg agc gcc gtc tat ggg ctg aac gat ctc atc aca ctg ggt       1248
Gly Ala Pro Ser Ala Val Tyr Gly Leu Asn Asp Leu Ile Thr Leu Gly
                405             410             415

tcg gcg ctc aga acg ccg ttc aag agt gtt cat ttc gtt gga acg gag       1296
Ser Ala Leu Arg Thr Pro Phe Lys Ser Val His Phe Val Gly Thr Glu
                420             425             430

acg tct tta gtt tgg aaa ggg tat atg gaa ggg gcc ata cga tcg ggt       1344
Thr Ser Leu Val Trp Lys Gly Tyr Met Glu Gly Ala Ile Arg Ser Gly
                435             440             445

caa cga ggt gct gca gaa gtt gtg gct agc ctg gtg cca gca gca           1389
Gln Arg Gly Ala Ala Glu Val Val Ala Ser Leu Val Pro Ala Ala
        450             455             460

tag                                                                   1392


        <210> 11
        <211> 463
        <212> PRT
        <213> Exophiala spinifera


        <400> 11
Lys Asp Asn Val Ala Asp Val Val Val Gly Ala Gly Leu Ser Gly
 1               5                   10                  15
Leu Glu Thr Ala Arg Lys Val Gln Ala Ala Gly Leu Ser Cys Leu Val
                20                  25                  30
Leu Glu Ala Met Asp Arg Val Gly Gly Lys Thr Leu Ser Val Gln Ser
        35                  40                  45
Gly Pro Gly Arg Thr Thr Ile Asn Asp Leu Gly Ala Ala Trp Ile Asn
        50                  55                  60
Asp Ser Asn Gln Ser Glu Val Ser Arg Leu Phe Glu Arg Phe His Leu
                                12
```

```
65                    70                    75                    80
Glu Gly Glu Leu Gln Arg Thr Thr Gly Asn Ser Ile His Gln Ala Gln
                85                    90                    95
Asp Gly Thr Thr Thr Thr Ala Pro Tyr Gly Asp Ser Leu Leu Ser Glu
            100                   105                   110
Glu Val Ala Ser Ala Leu Ala Glu Leu Leu Pro Val Trp Ser Gln Leu
            115                   120                   125
Ile Glu Glu His Ser Leu Gln Asp Leu Lys Ala Ser Pro Gln Ala Lys
        130                   135                   140
Arg Leu Asp Ser Val Ser Phe Ala His Tyr Cys Glu Lys Glu Leu Asn
145                   150                   155                   160
Leu Pro Ala Val Leu Gly Val Ala Asn Gln Ile Thr Arg Ala Leu Leu
            165                   170                   175
Gly Val Glu Ala His Glu Ile Ser Met Leu Phe Leu Thr Asp Tyr Ile
            180                   185                   190
Lys Ser Ala Thr Gly Leu Ser Asn Ile Phe Ser Asp Lys Lys Asp Gly
            195                   200                   205
Gly Gln Tyr Met Arg Cys Lys Thr Gly Met Gln Ser Ile Cys His Ala
        210                   215                   220
Met Ser Lys Glu Leu Val Pro Gly Ser Val His Leu Asn Thr Pro Val
225                   230                   235                   240
Ala Glu Ile Glu Gln Ser Ala Ser Gly Cys Thr Val Arg Ser Ala Ser
            245                   250                   255
Gly Ala Val Phe Arg Ser Lys Lys Val Val Val Ser Leu Pro Thr Thr
            260                   265                   270
Leu Tyr Pro Thr Leu Thr Phe Ser Pro Pro Leu Pro Ala Glu Lys Gln
            275                   280                   285
Ala Leu Ala Glu Asn Ser Ile Leu Gly Tyr Tyr Ser Lys Ile Val Phe
        290                   295                   300
Val Trp Asp Lys Pro Trp Trp Arg Glu Gln Gly Phe Ser Gly Val Leu
305                   310                   315                   320
Gln Ser Ser Cys Asp Pro Ile Ser Phe Ala Arg Asp Thr Ser Ile Asp
            325                   330                   335
Val Asp Arg Gln Trp Ser Ile Thr Cys Phe Met Val Gly Asp Pro Gly
        340                   345                   350
Arg Lys Trp Ser Gln Gln Ser Lys Gln Val Arg Gln Lys Ser Val Trp
        355                   360                   365
Asp Gln Leu Arg Ala Ala Tyr Glu Asn Ala Gly Ala Gln Val Pro Glu
    370                   375                   380
Pro Ala Asn Val Leu Glu Ile Glu Trp Ser Lys Gln Gln Tyr Phe Gln
385                   390                   395                   400
Gly Ala Pro Ser Ala Val Tyr Gly Leu Asn Asp ·Leu Ile Thr Leu Gly
            405                   410                   415
Ser Ala Leu Arg Thr Pro Phe Lys Ser Val His Phe Val Gly Thr Glu
            420                   425                   430
Thr Ser Leu Val Trp Lys Gly Tyr Met Glu Gly Ala Ile Arg Ser Gly
        435                   440                   445
Gln Arg Gly Ala Ala Glu Val Val Ala Ser Leu Val Pro Ala Ala
    450                   455                   460
```

        <210> 12
        <211> 34
        <212> DNA
        <213> Artificial Sequence

        <220>
        <223> Primer sequence designed for cloning DNA into
              expression vectors, N23256

13

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        <400> 12
ggggaattca aagacaacgt tgcggacgtg gtag                                  34

        <210> 13
        <211> 34
        <212> DNA
        <213> Artificial Sequence

        <220>
        <223> Primer sequence designed for cloning DNA into
              expression vectors, N23259


        <400> 13
ggggcggccg cctatgctgc tggcaccagg ctag                                  34

        <210> 14
        <211> 29
        <212> DNA
        <213> Artificial Sequence

        <220>
        <223> Designed oligonucleotide for 3' RACE, N21965

        <400> 14
tggtttcgtt accgacaacc ttgtatccc                                       29

        <210> 15
        <211> 28
        <212> DNA
        <213> Artificial Sequence

        <220>
        <223> Designed oligonucleotide for 5' race, N21968

        <400> 15
gagttggtcc cagacagact tttgtcgt                                        28

        <210> 16
        <211> 1673
        <212> DNA
        <213> Exophiala spinifera

        <220>
        <221> sig_peptide
        <222> (1)...(267)
        <223> yeast alpha mating factor secretion signal.

        <221> CDS
        <222> (1)...(1662)

        <400> 16
atg aga ttt cct tca att ttt act gct gtt tta ttc gca gca tcc tcc       48
Met Arg Phe Pro Ser Ile Phe Thr Ala Val Leu Phe Ala Ala Ser Ser
              -85                 -80                 -75
```

```
gca tta gct gct cca gtc aac act aca aca gaa gat gaa acg gca caa          96
Ala Leu Ala Ala Pro Val Asn Thr Thr Thr Glu Asp Glu Thr Ala Gln
            -70             -65             -60

att ccg gct gaa gct gtc atc ggt tac tca gat tta gaa ggg gat ttc         144
Ile Pro Ala Glu Ala Val Ile Gly Tyr Ser Asp Leu Glu Gly Asp Phe
            -55             -50             -45

gat gtt gct gtt ttg cca ttt tcc aac agc aca aat aac ggg tta ttg         192
Asp Val Ala Val Leu Pro Phe Ser Asn Ser Thr Asn Asn Gly Leu Leu
            -40             -35             -30

ttt ata aat act act att gcc agc att gct gct aaa gaa gaa ggg gta         240
Phe Ile Asn Thr Thr Ile Ala Ser Ile Ala Ala Lys Glu Glu Gly Val
-25             -20             -15             -10

tct ctc gag aaa aga gag gct gaa gct gaa ttc aaa gac aac gtt gcg         288
Ser Leu Glu Lys Arg Glu Ala Glu Ala Glu Phe Lys Asp Asn Val Ala
            -5                  1               5

gac gtg gta gtg gtg ggc gct ggc ttg agc ggt ttg gag acg gca cgc         336
Asp Val Val Val Val Gly Ala Gly Leu Ser Gly Leu Glu Thr Ala Arg
            10                  15              20

aaa gtc cag gcc gcc ggt ctg tcc tgc ctc gtt ctt gag gcg atg gat         384
Lys Val Gln Ala Ala Gly Leu Ser Cys Leu Val Leu Glu Ala Met Asp
        25              30                  35

cgt gta ggg gga aag act ctg agc gta caa tcg ggt ccc ggc agg acg         432
Arg Val Gly Gly Lys Thr Leu Ser Val Gln Ser Gly Pro Gly Arg Thr
 40                 45                  50                  55

act atc aac gac ctc ggc gct gcg tgg atc aat gac agc aac caa agc         480
Thr Ile Asn Asp Leu Gly Ala Ala Trp Ile Asn Asp Ser Asn Gln Ser
                60                  65                  70

gaa gta tcc aga ttg ttt gaa aga ttt cat ttg gag ggc gag ctc cag        528
Glu Val Ser Arg Leu Phe Glu Arg Phe His Leu Glu Gly Glu Leu Gln
            75                  80                  85

agg acg act gga aat tca atc cat caa gca caa gac ggt aca acc act        576
Arg Thr Thr Gly Asn Ser Ile His Gln Ala Gln Asp Gly Thr Thr Thr
        90                  95                  100

aca gct cct tat ggt gac tcc ttg ctg agc gag gag gtt gca agt gca        624
Thr Ala Pro Tyr Gly Asp Ser Leu Leu Ser Glu Glu Val Ala Ser Ala
        105                 110                 115

ctt gcg gaa ctc ctc ccc gta tgg tct cag ctg atc gaa gag cat agc        672
Leu Ala Glu Leu Leu Pro Val Trp Ser Gln Leu Ile Glu Glu His Ser
120                 125                 130                 135

ctt caa gac ctc aag gcg agc cct cag gcg aag cgg ctc gac agt gtg        720
Leu Gln Asp Leu Lys Ala Ser Pro Gln Ala Lys Arg Leu Asp Ser Val
            140                 145                 150

agc ttc gcg cac tac tgt gag aag gaa cta aac ttg cct gct gtt ctc        768
Ser Phe Ala His Tyr Cys Glu Lys Glu Leu Asn Leu Pro Ala Val Leu
```
15

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                155                      160                      165

ggc gta gca aac cag atc aca cgc gct ctg ctc ggt gtg gaa gcc cac        816
Gly Val Ala Asn Gln Ile Thr Arg Ala Leu Leu Gly Val Glu Ala His
        170              175              180

gag atc agc atg ctt ttt ctc acc gac tac atc aag agt gcc acc ggt        864
Glu Ile Ser Met Leu Phe Leu Thr Asp Tyr Ile Lys Ser Ala Thr Gly
    185              190              195

ctc agt aat att ttc tcg gac aag aaa gac ggc ggg cag tat atg cga        912
Leu Ser Asn Ile Phe Ser Asp Lys Lys Asp Gly Gly Gln Tyr Met Arg
200              205              210              215

tgc aaa aca ggt atg cag tcg att tgc cat gcc atg tca aag gaa ctt        960
Cys Lys Thr Gly Met Gln Ser Ile Cys His Ala Met Ser Lys Glu Leu
            220              225              230

gtt cca ggc tca gtg cac ctc aac acc ccc gtc gct gaa att gag cag       1008
Val Pro Gly Ser Val His Leu Asn Thr Pro Val Ala Glu Ile Glu Gln
            235              240              245

tcg gca tcc ggc tgt aca gta cga tcg gcc tcg ggc gcc gtg ttc cga       1056
Ser Ala Ser Gly Cys Thr Val Arg Ser Ala Ser Gly Ala Val Phe Arg
        250              255              260

agc aaa aag gtg gtg gtt tcg tta ccg aca acc ttg tat ccc acc ttg       1104
Ser Lys Lys Val Val Val Ser Leu Pro Thr Thr Leu Tyr Pro Thr Leu
        265              270              275

aca ttt tca cca cct ctt ccc gcc gag aag caa gca ttg gcg gaa aat       1152
Thr Phe Ser Pro Pro Leu Pro Ala Glu Lys Gln Ala Leu Ala Glu Asn
280              285              290              295

tct atc ctg ggc tac tat agc aag ata gtc ttc gta tgg gac aag ccg       1200
Ser Ile Leu Gly Tyr Tyr Ser Lys Ile Val Phe Val Trp Asp Lys Pro
            300              305              310

tgg tgg cgc gaa caa ggc ttc tcg ggc gtc ctc caa tcg agc tgt gac       1248
Trp Trp Arg Glu Gln Gly Phe Ser Gly Val Leu Gln Ser Ser Cys Asp
            315              320              325

ccc atc tca ttt gcc aga gat acc agc atc gac gtc gat cga caa tgg       1296
Pro Ile Ser Phe Ala Arg Asp Thr Ser Ile Asp Val Asp Arg Gln Trp
            330              335              340

tcc att acc tgt ttc atg gtc gga gac ccg gga cgg aag tgg tcc caa       1344
Ser Ile Thr Cys Phe Met Val Gly Asp Pro Gly Arg Lys Trp Ser Gln
            345              350              355

cag tcc aag cag gta cga caa aag tct gtc tgg gac caa ctc cgc gca       1392
Gln Ser Lys Gln Val Arg Gln Lys Ser Val Trp Asp Gln Leu Arg Ala
360              365              370              375

gcc tac gag aac gcc ggg gcc caa gtc cca gag ccg gcc aac gtg ctc       1440
Ala Tyr Glu Asn Ala Gly Ala Gln Val Pro Glu Pro Ala Asn Val Leu
            380              385              390

                                16
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```
gaa atc gag tgg tcg aag cag cag tat ttc caa gga gct ccg agc gcc      1488
Glu Ile Glu Trp Ser Lys Gln Gln Tyr Phe Gln Gly Ala Pro Ser Ala
            395                 400                 405

gtc tat ggg ctg aac gat ctc atc aca ctg ggt tcg gcg ctc aga acg      1536
Val Tyr Gly Leu Asn Asp Leu Ile Thr Leu Gly Ser Ala Leu Arg Thr
            410                 415                 420

ccg ttc aag agt gtt cat ttc gtt gga acg gag acg tct tta gtt tgg      1584
Pro Phe Lys Ser Val His Phe Val Gly Thr Glu Thr Ser Leu Val Trp
            425                 430                 435

aaa ggg tat atg gaa ggg gcc ata cga tcg ggt caa cga ggt gct gca      1632
Lys Gly Tyr Met Glu Gly Ala Ile Arg Ser Gly Gln Arg Gly Ala Ala
440                 445                 450                 455

gaa gtt gtg gct agc ctg gtg cca gca gca taggcggccg c                 1673
Glu Val Val Ala Ser Leu Val Pro Ala Ala
                    460                 465


        <210> 17
        <211> 554
        <212> PRT
        <213> Exophiala spinifera

        <220>
        <221> SIGNAL
        <222> (1)...(89)

        <400> 17
Met Arg Phe Pro Ser Ile Phe Thr Ala Val Leu Phe Ala Ala Ser Ser
                -85                 -80                 -75
Ala Leu Ala Ala Pro Val Asn Thr Thr Thr Glu Asp Glu Thr Ala Gln
            -70                 -65                 -60
Ile Pro Ala Glu Ala Val Ile Gly Tyr Ser Asp Leu Glu Gly Asp Phe
            -55                 -50                 -45
Asp Val Ala Val Leu Pro Phe Ser Asn Ser Thr Asn Asn Gly Leu Leu
            -40                 -35                 -30
Phe Ile Asn Thr Thr Ile Ala Ser Ile Ala Ala Lys Glu Glu Gly Val
-25                 -20                 -15                 -10
Ser Leu Glu Lys Arg Glu Ala Glu Ala Glu Phe Lys Asp Asn Val Ala
                -5                  1                   5
Asp Val Val Val Val Gly Ala Gly Leu Ser Gly Leu Glu Thr Ala Arg
            10                  15                  20
Lys Val Gln Ala Ala Gly Leu Ser Cys Leu Val Leu Glu Ala Met Asp
    25                  30                  35
Arg Val Gly Gly Lys Thr Leu Ser Val Gln Ser Gly Pro Gly Arg Thr
40                  45                  50                  55
Thr Ile Asn Asp Leu Gly Ala Ala Trp Ile Asn Asp Ser Asn Gln Ser
                60                  65                  70
Glu Val Ser Arg Leu Phe Glu Arg Phe His Leu Glu Gly Glu Leu Gln
            75                  80                  85
Arg Thr Thr Gly Asn Ser Ile His Gln Ala Gln Asp Gly Thr Thr Thr
            90                  95                  100
Thr Ala Pro Tyr Gly Asp Ser Leu Leu Ser Glu Glu Val Ala Ser Ala
    105                 110                 115
Leu Ala Glu Leu Leu Pro Val Trp Ser Gln Leu Ile Glu Glu His Ser
                            17
```

```
120                     125                     130                     135
Leu Gln Asp Leu Lys Ala Ser Pro Gln Ala Lys Arg Leu Asp Ser Val
                140                     145                     150
Ser Phe Ala His Tyr Cys Glu Lys Glu Leu Asn Leu Pro Ala Val Leu
                155                     160                     165
Gly Val Ala Asn Gln Ile Thr Arg Ala Leu Leu Gly Val Glu Ala His
                170                     175                     180
Glu Ile Ser Met Leu Phe Leu Thr Asp Tyr Ile Lys Ser Ala Thr Gly
            185                     190                     195
Leu Ser Asn Ile Phe Ser Asp Lys Lys Asp Gly Gly Gln Tyr Met Arg
200                     205                     210                     215
Cys Lys Thr Gly Met Gln Ser Ile Cys His Ala Met Ser Lys Glu Leu
                220                     225                     230
Val Pro Gly Ser Val His Leu Asn Thr Pro Val Ala Glu Ile Glu Gln
            235                     240                     245
Ser Ala Ser Gly Cys Thr Val Arg Ser Ala Ser Gly Ala Val Phe Arg
            250                     255                     260
Ser Lys Lys Val Val Val Ser Leu Pro Thr Thr Leu Tyr Pro Thr Leu
            265                     270                     275
Thr Phe Ser Pro Pro Leu Pro Ala Glu Lys Gln Ala Leu Ala Glu Asn
280                     285                     290                     295
Ser Ile Leu Gly Tyr Tyr Ser Lys Ile Val Phe Val Trp Asp Lys Pro
                300                     305                     310
Trp Trp Arg Glu Gln Gly Phe Ser Gly Val Leu Gln Ser Ser Cys Asp
            315                     320                     325
Pro Ile Ser Phe Ala Arg Asp Thr Ser Ile Asp Val Asp Arg Gln Trp
            330                     335                     340
Ser Ile Thr Cys Phe Met Val Gly Asp Pro Gly Arg Lys Trp Ser Gln
            345                     350                     355
Gln Ser Lys Gln Val Arg Gln Lys Ser Val Trp Asp Gln Leu Arg Ala
360                     365                     370                     375
Ala Tyr Glu Asn Ala Gly Ala Gln Val Pro Glu Pro Ala Asn Val Leu
                380                     385                     390
Glu Ile Glu Trp Ser Lys Gln Gln Tyr Phe Gln Gly Ala Pro Ser Ala
            395                     400                     405
Val Tyr Gly Leu Asn Asp Leu Ile Thr Leu Gly Ser Ala Leu Arg Thr
            410                     415                     420
Pro Phe Lys Ser Val His Phe Val Gly Thr Glu Thr Ser Leu Val Trp
            425                     430                     435
Lys Gly Tyr Met Glu Gly Ala Ile Arg Ser Gly Gln Arg Gly Ala Ala
440                     445                     450                     455
Glu Val Val Ala Ser Leu Val Pro Ala Ala
                460                     465
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<210> 18
<211> 2079
<212> DNA
<213> Unknown

<220>
<223> GST:K:trAPAO 2079 nt. Translation starting at nt 1
      - 687, gst fusion + polylinker, 688-2076,
      K:trAPAO, extra lysine underlined; 2077-2079, stop
      codon. For bacterial expression.

<221> CDS
<222> (1)...(2076)

18

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<221> misc_feature
<222> (1)...(687)
<223> gst fusion + polylinker

<221> misc_feature
<222> (688)...(2076)
<223> K:trAPAO

<221> misc_feature
<222> (688)...(690)
<223> Extra lysine

        <400> 18
atg tcc cct ata cta ggt tat tgg aaa att aag ggc ctt gtg caa ccc       48
Met Ser Pro Ile Leu Gly Tyr Trp Lys Ile Lys Gly Leu Val Gln Pro
 1           5                  10                  15

act cga ctt ctt ttg gaa tat ctt gaa gaa aaa tat gaa gag cat ttg       96
Thr Arg Leu Leu Leu Glu Tyr Leu Glu Glu Lys Tyr Glu Glu His Leu
             20                  25                  30

tat gag cgc gat gaa ggt gat aaa tgg cga aac aaa aag ttt gaa ttg      144
Tyr Glu Arg Asp Glu Gly Asp Lys Trp Arg Asn Lys Lys Phe Glu Leu
             35                  40                  45

ggt ttg gag ttt ccc aat ctt cct tat tat att gat ggt gat gtt aaa      192
Gly Leu Glu Phe Pro Asn Leu Pro Tyr Tyr Ile Asp Gly Asp Val Lys
     50                  55                  60

tta aca cag tct atg gcc atc ata cgt tat ata gct gac aag cac aac      240
Leu Thr Gln Ser Met Ala Ile Ile Arg Tyr Ile Ala Asp Lys His Asn
 65                  70                  75                  80

atg ttg ggt ggt tgt cca aaa gag cgt gca gag att tca atg ctt gaa      288
Met Leu Gly Gly Cys Pro Lys Glu Arg Ala Glu Ile Ser Met Leu Glu
                 85                  90                  95

gga gcg gtt ttg gat att aga tac ggt gtt tcg aga att gca tat agt      336
Gly Ala Val Leu Asp Ile Arg Tyr Gly Val Ser Arg Ile Ala Tyr Ser
             100                 105                 110

aaa gac ttt gaa act ctc aaa gtt gat ttt ctt agc aag cta cct gaa      384
Lys Asp Phe Glu Thr Leu Lys Val Asp Phe Leu Ser Lys Leu Pro Glu
         115                 120                 125

atg ctg aaa atg ttc gaa gat cgt tta tgt cat aaa aca tat tta aat      432
Met Leu Lys Met Phe Glu Asp Arg Leu Cys His Lys Thr Tyr Leu Asn
         130                 135                 140

ggt gat cat gta acc cat cct gac ttc atg ttg tat gac gct ctt gat      480
Gly Asp His Val Thr His Pro Asp Phe Met Leu Tyr Asp Ala Leu Asp
145                 150                 155                 160

gtt gtt tta tac atg gac cca atg tgc ctg gat gcg ttc cca aaa tta      528
Val Val Leu Tyr Met Asp Pro Met Cys Leu Asp Ala Phe Pro Lys Leu
                 165                 170                 175
```

19

```
gtt tgt ttt aaa aaa cgt att gaa gct atc cca caa att gat aag tac        576
Val Cys Phe Lys Lys Arg Ile Glu Ala Ile Pro Gln Ile Asp Lys Tyr
            180                 185                 190

ttg aaa tcc agc aag tat ata gca tgg cct ttg cag ggc tgg caa gcc        624
Leu Lys Ser Ser Lys Tyr Ile Ala Trp Pro Leu Gln Gly Trp Gln Ala
            195                 200                 205

acg ttt ggt ggt ggc gac cat cct cca aaa tcg gat ctg gtt ccg cgt        672
Thr Phe Gly Gly Gly Asp His Pro Pro Lys Ser Asp Leu Val Pro Arg
    210                 215                 220

gga tcc ccg gaa ttc aaa gac aac gtt gcg gac gtg gta gtg gtg ggc        720
Gly Ser Pro Glu Phe Lys Asp Asn Val Ala Asp Val Val Val Val Gly
225                 230                 235                 240

gct ggc ttg agc ggt ttg gag acg gca cgc aaa gtc cag gcc gcc ggt        768
Ala Gly Leu Ser Gly Leu Glu Thr Ala Arg Lys Val Gln Ala Ala Gly
            245                 250                 255

ctg tcc tgc ctc gtt ctt gag gcg atg gat cgt gta ggg gga aag act        816
Leu Ser Cys Leu Val Leu Glu Ala Met Asp Arg Val Gly Gly Lys Thr
            260                 265                 270

ctg agc gta caa tcg ggt ccc ggc agg acg act atc aac gac ctc ggc        864
Leu Ser Val Gln Ser Gly Pro Gly Arg Thr Thr Ile Asn Asp Leu Gly
            275                 280                 285

gct gcg tgg atc aat gac agc aac caa agc gaa gta tcc aga ttg ttt        912
Ala Ala Trp Ile Asn Asp Ser Asn Gln Ser Glu Val Ser Arg Leu Phe
    290                 295                 300

gaa aga ttt cat ttg gag ggc gag ctc cag agg acg act gga aat tca        960
Glu Arg Phe His Leu Glu Gly Glu Leu Gln Arg Thr Thr Gly Asn Ser
305                 310                 315                 320

atc cat caa gca caa gac ggt aca acc act aca gct cct tat ggt gac       1008
Ile His Gln Ala Gln Asp Gly Thr Thr Thr Thr Ala Pro Tyr Gly Asp
                325                 330                 335

tcc ttg ctg agc gag gag gtt gca agt gca ctt gcg gaa ctc ctc ccc       1056
Ser Leu Leu Ser Glu Glu Val Ala Ser Ala Leu Ala Glu Leu Leu Pro
            340                 345                 350

gta tgg tct cag ctg atc gaa gag cat agc ctt caa gac ctc aag gcg       1104
Val Trp Ser Gln Leu Ile Glu Glu His Ser Leu Gln Asp Leu Lys Ala
            355                 360                 365

agc cct cag gcg aag cgg ctc gac agt gtg agc ttc gcg cac tac tgt       1152
Ser Pro Gln Ala Lys Arg Leu Asp Ser Val Ser Phe Ala His Tyr Cys
    370                 375                 380

gag aag gaa cta aac ttg cct gct gtt ctc ggc gta gca aac cag atc       1200
Glu Lys Glu Leu Asn Leu Pro Ala Val Leu Gly Val Ala Asn Gln Ile
385                 390                 395                 400

aca cgc gct ctg ctc ggt gtg gaa gcc cac gag atc agc atg ctt ttt       1248
Thr Arg Ala Leu Leu Gly Val Glu Ala His Glu Ile Ser Met Leu Phe
```

20

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ctc acc gac tac atc aag agt gcc acc ggt ctc agt aat att ttc tcg    1296
Leu Thr Asp Tyr Ile Lys Ser Ala Thr Gly Leu Ser Asn Ile Phe Ser
        420                 425                 430

gac aag aaa gac ggc ggg cag tat atg cga tgc aaa aca ggt atg cag    1344
Asp Lys Lys Asp Gly Gly Gln Tyr Met Arg Cys Lys Thr Gly Met Gln
        435                 440                 445

tcg att tgc cat gcc atg tca aag gaa ctt gtt cca ggc tca gtg cac    1392
Ser Ile Cys His Ala Met Ser Lys Glu Leu Val Pro Gly Ser Val His
        450                 455                 460

ctc aac acc ccc gtc gct gaa att gag cag tcg gca tcc ggc tgt aca    1440
Leu Asn Thr Pro Val Ala Glu Ile Glu Gln Ser Ala Ser Gly Cys Thr
465                 470                 475                 480

gta cga tcg gcc tcg ggc gcc gtg ttc cga agc aaa aag gtg gtg gtt    1488
Val Arg Ser Ala Ser Gly Ala Val Phe Arg Ser Lys Lys Val Val Val
            485                 490                 495

tcg tta ccg aca acc ttg tat ccc acc ttg aca ttt tca cca cct ctt    1536
Ser Leu Pro Thr Thr Leu Tyr Pro Thr Leu Thr Phe Ser Pro Pro Leu
            500                 505                 510

ccc gcc gag aag caa gca ttg gcg gaa aat tct atc ctg ggc tac tat    1584
Pro Ala Glu Lys Gln Ala Leu Ala Glu Asn Ser Ile Leu Gly Tyr Tyr
            515                 520                 525

agc aag ata gtc ttc gta tgg gac aag ccg tgg tgg cgc gaa caa ggc    1632
Ser Lys Ile Val Phe Val Trp Asp Lys Pro Trp Trp Arg Glu Gln Gly
        530                 535                 540

ttc tcg ggc gtc ctc caa tcg agc tgt gac ccc atc tca ttt gcc aga    1680
Phe Ser Gly Val Leu Gln Ser Ser Cys Asp Pro Ile Ser Phe Ala Arg
545                 550                 555                 560

gat acc agc atc gac gtc gat cga caa tgg tcc att acc tgt ttc atg    1728
Asp Thr Ser Ile Asp Val Asp Arg Gln Trp Ser Ile Thr Cys Phe Met
                565                 570                 575

gtc gga gac ccg gga cgg aag tgg tcc caa cag tcc aag cag gta cga    1776
Val Gly Asp Pro Gly Arg Lys Trp Ser Gln Gln Ser Lys Gln Val Arg
            580                 585                 590

caa aag tct gtc tgg gac caa ctc cgc gca gcc tac gag aac gcc ggg    1824
Gln Lys Ser Val Trp Asp Gln Leu Arg Ala Ala Tyr Glu Asn Ala Gly
        595                 600                 605

gcc caa gtc cca gag ccg gcc aac gtg ctc gaa atc gag tgg tcg aag    1872
Ala Gln Val Pro Glu Pro Ala Asn Val Leu Glu Ile Glu Trp Ser Lys
        610                 615                 620

cag cag tat ttc caa gga gct ccg agc gcc gtc tat ggg ctg aac gat    1920
Gln Gln Tyr Phe Gln Gly Ala Pro Ser Ala Val Tyr Gly Leu Asn Asp
625                 630                 635                 640
```

21

```
ctc atc aca ctg ggt tcg gcg ctc aga acg ccg ttc aag agt gtt cat     1968
Leu Ile Thr Leu Gly Ser Ala Leu Arg Thr Pro Phe Lys Ser Val His
            645             Arg     650             655

ttc gtt gga acg gag acg tct tta gtt tgg aaa ggg tat atg gaa ggg     2016
Phe Val Gly Thr Glu Thr Ser Leu Val Trp Lys Gly Tyr Met Glu Gly
            660             665             670

gcc ata cga tcg ggt caa cga ggt gct gca gaa gtt gtg gct agc ctg     2064
Ala Ile Arg Ser Gly Gln Arg Gly Ala Ala Glu Val Val Ala Ser Leu
            675             680             685

gtg cca gca gca tag                                                  2079
Val Pro Ala Ala
    690


        <210> 19
        <211> 692
        <212> PRT
        <213> Unknown

        <400> 19
Met Ser Pro Ile Leu Gly Tyr Trp Lys Ile Lys Gly Leu Val Gln Pro
 1           5               10                  15
Thr Arg Leu Leu Leu Glu Tyr Leu Glu Glu Lys Tyr Glu Glu His Leu
            20              25                  30
Tyr Glu Arg Asp Glu Gly Asp Lys Trp Arg Asn Lys Lys Phe Glu Leu
            35              40                  45
Gly Leu Glu Phe Pro Asn Leu Pro Tyr Tyr Ile Asp Gly Asp Val Lys
    50              55                  60
Leu Thr Gln Ser Met Ala Ile Ile Arg Tyr Ile Ala Asp Lys His Asn
65                  70                  75                      80
Met Leu Gly Gly Cys Pro Lys Glu Arg Ala Glu Ile Ser Met Leu Glu
                85                  90                  95
Gly Ala Val Leu Asp Ile Arg Tyr Gly Val Ser Arg Ile Ala Tyr Ser
            100             105                 110
Lys Asp Phe Glu Thr Leu Lys Val Asp Phe Leu Ser Lys Leu Pro Glu
            115             120                 125
Met Leu Lys Met Phe Glu Asp Arg Leu Cys His Lys Thr Tyr Leu Asn
            130             135                 140
Gly Asp His Val Thr His Pro Asp Phe Met Leu Tyr Asp Ala Leu Asp
145                 150                 155                     160
Val Val Leu Tyr Met Asp Pro Met Cys Leu Asp Ala Phe Pro Lys Leu
                165                 170                 175
Val Cys Phe Lys Lys Arg Ile Glu Ala Ile Pro Gln Ile Asp Lys Tyr
                180                 185                 190
Leu Lys Ser Ser Lys Tyr Ile Ala Trp Pro Leu Gln Gly Trp Gln Ala
            195                 200                 205
Thr Phe Gly Gly Gly Asp His Pro Pro Lys Ser Asp Leu Val Pro Arg
    210                 215                 220
Gly Ser Pro Glu Phe Lys Asp Asn Val Ala Asp Val Val Val Val Gly
225                 230                 235                     240
Ala Gly Leu Ser Gly Leu Glu Thr Ala Arg Lys Val Gln Ala Ala Gly
                245                 250                 255
Leu Ser Cys Leu Val Leu Glu Ala Met Asp Arg Val Gly Gly Lys Thr
                260                 265                 270
Leu Ser Val Gln Ser Gly Pro Gly Arg Thr Thr Ile Asn Asp Leu Gly
                            22
```

```
                275                     280                     285
Ala Ala Trp Ile Asn Asp Ser Asn Gln Ser Glu Val Ser Arg Leu Phe
    290                     295                 300
Glu Arg Phe His Leu Glu Gly Glu Leu Gln Arg Thr Thr Gly Asn Ser
305                     310                 315                 320
Ile His Gln Ala Gln Asp Gly Thr Thr Thr Thr Ala Pro Tyr Gly Asp
                325                     330                 335
Ser Leu Leu Ser Glu Glu Val Ala Ser Ala Leu Ala Glu Leu Leu Pro
                340                     345                 350
Val Trp Ser Gln Leu Ile Glu Glu His Ser Leu Gln Asp Leu Lys Ala
                355                     360                 365
Ser Pro Gln Ala Lys Arg Leu Asp Ser Val Ser Phe Ala His Tyr Cys
    370                     375                 380
Glu Lys Glu Leu Asn Leu Pro Ala Val Leu Gly Val Ala Asn Gln Ile
385                     390                 395                 400
Thr Arg Ala Leu Leu Gly Val Glu Ala His Glu Ile Ser Met Leu Phe
                405                     410                 415
Leu Thr Asp Tyr Ile Lys Ser Ala Thr Gly Leu Ser Asn Ile Phe Ser
                420                     425                 430
Asp Lys Lys Asp Gly Gly Gln Tyr Met Arg Cys Lys Thr Gly Met Gln
                435                     440                 445
Ser Ile Cys His Ala Met Ser Lys Glu Leu Val Pro Gly Ser Val His
    450                     455                 460
Leu Asn Thr Pro Val Ala Glu Ile Glu Gln Ser Ala Ser Gly Cys Thr
465                     470                 475                 480
Val Arg Ser Ala Ser Gly Ala Val Phe Arg Ser Lys Lys Val Val Val
                485                     490                 495
Ser Leu Pro Thr Thr Leu Tyr Pro Thr Leu Thr Phe Ser Pro Pro Leu
                500                     505                 510
Pro Ala Glu Lys Gln Ala Leu Ala Glu Asn Ser Ile Leu Gly Tyr Tyr
    515                     520                 525
Ser Lys Ile Val Phe Val Trp Asp Lys Pro Trp Trp Arg Glu Gln Gly
    530                     535                 540
Phe Ser Gly Val Leu Gln Ser Ser Cys Asp Pro Ile Ser Phe Ala Arg
545                     550                 555                 560
Asp Thr Ser Ile Asp Val Asp Arg Gln Trp Ser Ile Thr Cys Phe Met
                565                     570                 575
Val Gly Asp Pro Gly Arg Lys Trp Ser Gln Gln Ser Lys Gln Val Arg
                580                     585                 590
Gln Lys Ser Val Trp Asp Gln Leu Arg Ala Ala Tyr Glu Asn Ala Gly
    595                     600                 605
Ala Gln Val Pro Glu Pro Ala Asn Val Leu Glu Ile Glu Trp Ser Lys
    610                     615                 620
Gln Gln Tyr Phe Gln Gly Ala Pro Ser Ala Val Tyr Gly Leu Asn Asp
625                     630                 635                 640
Leu Ile Thr Leu Gly Ser Ala Leu Arg Thr Pro Phe Lys Ser Val His
                645                     650                 655
Phe Val Gly Thr Glu Thr Ser Leu Val Trp Lys Gly Tyr Met Glu Gly
                660                     665                 670
Ala Ile Arg Ser Gly Gln Arg Gly Ala Ala Glu Val Val Ala Ser Leu
    675                     680                 685
Val Pro Ala Ala
    690

        <210> 20
        <211> 1464
        <212> DNA
        <213> Unknown
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23

<220>
<223> Nucleotide sequence of K:trAPAO translational
      fusion with barley alpha amylase signal sequence,
      for expression and secretion of the mature trAPAO
      in maize. Nucleotides 1-72, barley alpha amylase
      signal sequence, nucleotides 73-75, added lysine
      residue; nucleotides 76 -1464 , trAPAO cDNA.

<221> sig_peptide
<222> (1)...(72)
<223> Barley alpha amylase signal sequence

<221> misc_feature
<222> (73)...(1464)
<223> K:trAPAOcDNA

<221> CDS
<222> (1)...(1461)

<221> misc_feature
<222> (73)...(75)
<223> Added lysine residue

<400> 20
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atg gcc aac aag cac ctg agc ctc tcc ctc ttc ctc gtg ctc ctc ggc      48
Met Ala Asn Lys His Leu Ser Leu Ser Leu Phe Leu Val Leu Leu Gly
            -20                 -15                 -10

ctc tcc gcc tcc ctc gcc agc ggc aaa gac aac gtt gcg gac gtg gta      96
Leu Ser Ala Ser Leu Ala Ser Gly Lys Asp Asn Val Ala Asp Val Val
            -5                  1                   5

gtg gtg ggc gct ggc ttg agc ggt ttg gag acg gca cgc aaa gtc cag     144
Val Val Gly Ala Gly Leu Ser Gly Leu Glu Thr Ala Arg Lys Val Gln
    10                  15                  20

gcc gcc ggt ctg tcc tgc ctc gtt ctt gag gcg atg gat cgt gta ggg     192
Ala Ala Gly Leu Ser Cys Leu Val Leu Glu Ala Met Asp Arg Val Gly
 25                 30                  35                  40

gga aag act ctg agc gta caa tcg ggt ccc ggc agg acg act atc aac     240
Gly Lys Thr Leu Ser Val Gln Ser Gly Pro Gly Arg Thr Thr Ile Asn
                45                  50                  55

gac ctc ggc gct gcg tgg atc aat gac agc aac caa agc gaa gta tcc     288
Asp Leu Gly Ala Ala Trp Ile Asn Asp Ser Asn Gln Ser Glu Val Ser
                60                  65                  70

aga ttg ttt gaa aga ttt cat ttg gag ggc gag ctc cag agg acg act     336
Arg Leu Phe Glu Arg Phe His Leu Glu Gly Glu Leu Gln Arg Thr Thr
        75                  80                  85

gga aat tca atc cat caa gca caa gac ggt aca acc act aca gct cct     384
Gly Asn Ser Ile His Gln Ala Gln Asp Gly Thr Thr Thr Thr Ala Pro
    90                  95                  100
```

24

```
tat ggt gac tcc ttg ctg agc gag gag gtt gca agt gca ctt gcg gaa      432
Tyr Gly Asp Ser Leu Leu Ser Glu Glu Val Ala Ser Ala Leu Ala Glu
105                 110                 115                 120

ctc ctc ccc gta tgg tct cag ctg atc gaa gag cat agc ctt caa gac      480
Leu Leu Pro Val Trp Ser Gln Leu Ile Glu Glu His Ser Leu Gln Asp
                    125                 130                 135

ctc aag gcg agc cct cag gcg aag cgg ctc gac agt gtg agc ttc gcg      528
Leu Lys Ala Ser Pro Gln Ala Lys Arg Leu Asp Ser Val Ser Phe Ala
                140                 145                 150

cac tac tgt gag aag gaa cta aac ttg cct gct gtt ctc ggc gta gca      576
His Tyr Cys Glu Lys Glu Leu Asn Leu Pro Ala Val Leu Gly Val Ala
            155                 160                 165

aac cag atc aca cgc gct ctg ctc ggt gtg gaa gcc cac gag atc agc      624
Asn Gln Ile Thr Arg Ala Leu Leu Gly Val Glu Ala His Glu Ile Ser
        170                 175                 180

atg ctt ttt ctc acc gac tac atc aag agt gcc acc ggt ctc agt aat      672
Met Leu Phe Leu Thr Asp Tyr Ile Lys Ser Ala Thr Gly Leu Ser Asn
185                 190                 195                 200

att ttc tcg gac aag aaa gac ggc ggg cag tat atg cga tgc aaa aca      720
Ile Phe Ser Asp Lys Lys Asp Gly Gly Gln Tyr Met Arg Cys Lys Thr
                205                 210                 215

ggt atg cag tcg att tgc cat gcc atg tca aag gaa ctt gtt cca ggc      768
Gly Met Gln Ser Ile Cys His Ala Met Ser Lys Glu Leu Val Pro Gly
                220                 225                 230

tca gtg cac ctc aac acc ccc gtc gct gaa att gag cag tcg gca tcc      816
Ser Val His Leu Asn Thr Pro Val Ala Glu Ile Glu Gln Ser Ala Ser
            235                 240                 245

ggc tgt aca gta cga tcg gcc tcg ggc gcc gtg ttc cga agc aaa aag      864
Gly Cys Thr Val Arg Ser Ala Ser Gly Ala Val Phe Arg Ser Lys Lys
        250                 255                 260

gtg gtg gtt tcg tta ccg aca acc ttg tat ccc acc ttg aca ttt tca      912
Val Val Val Ser Leu Pro Thr Thr Leu Tyr Pro Thr Leu Thr Phe Ser
265                 270                 275                 280

cca cct ctt ccc gcc gag aag càa gca ttg gcg gaa aat tct atc ctg      960
Pro Pro Leu Pro Ala Glu Lys Gln Ala Leu Ala Glu Asn Ser Ile Leu
                285                 290                 295

ggc tac tat agc aag ata gtc ttc gta tgg gac aag ccg tgg tgg cgc     1008
Gly Tyr Tyr Ser Lys Ile Val Phe Val Trp Asp Lys Pro Trp Trp Arg
                300                 305                 310

gaa caa ggc ttc tcg ggc gtc ctc caa tcg agc tgt gac ccc atc tca     1056
Glu Gln Gly Phe Ser Gly Val Leu Gln Ser Ser Cys Asp Pro Ile Ser
            315                 320                 325

ttt gcc aga gat acc agc atc gac gtc gat cga caa tgg tcc att acc     1104
Phe Ala Arg Asp Thr Ser Ile Asp Val Asp Arg Gln Trp Ser Ile Thr
```

25

```
            330                          335                          340
tgt ttc atg gtc gga gac ccg gga cgg aag tgg tcc caa cag tcc aag    1152
Cys Phe Met Val Gly Asp Pro Gly Arg Lys Trp Ser Gln Gln Ser Lys
345                          350                          355                          360

cag gta cga caa aag tct gtc tgg gac caa ctc cgc gca gcc tac gag    1200
Gln Val Arg Gln Lys Ser Val Trp Asp Gln Leu Arg Ala Ala Tyr Glu
                             365                          370                          375

aac gcc ggg gcc caa gtc cca gag ccg gcc aac gtg ctc gaa atc gag    1248
Asn Ala Gly Ala Gln Val Pro Glu Pro Ala Asn Val Leu Glu Ile Glu
                             380                          385                          390


tgg tcg aag cag cag tat ttc caa gga gct ccg agc gcc gtc tat ggg    1296
Trp Ser Lys Gln Gln Tyr Phe Gln Gly Ala Pro Ser Ala Val Tyr Gly
                             395                          400                          405

ctg aac gat ctc atc aca ctg ggt tcg gcg ctc aga acg ccg ttc aag    1344
Leu Asn Asp Leu Ile Thr Leu Gly Ser Ala Leu Arg Thr Pro Phe Lys
                             410                          415                          420

agt gtt cat ttc gtt gga acg gag acg tct tta gtt tgg aaa ggg tat    1392
Ser Val His Phe Val Gly Thr Glu Thr Ser Leu Val Trp Lys Gly Tyr
425                          430                          435                          440

atg gaa ggg gcc ata cga tcg ggt caa cga ggt gct gca gaa gtt gtg    1440
Met Glu Gly Ala Ile Arg Ser Gly Gln Arg Gly Ala Ala Glu Val Val
                             445                          450                          455

gct agc ctg gtg cca gca gca tag                                    1464
Ala Ser Leu Val Pro Ala Ala
                             460


        <210> 21
        <211> 487
        <212> PRT
        <213> Unknown

        <220>
        <221> SIGNAL
        <222> (1)...(24)

        <400> 21
Met Ala Asn Lys His Leu Ser Leu Ser Leu Phe Leu Val Leu Leu Gly
                  -20                      -15                      -10
Leu Ser Ala Ser Leu Ala Ser Gly Lys Asp Asn Val Ala Asp Val Val
                  -5                       1                        5
Val Val Gly Ala Gly Leu Ser Gly Leu Glu Thr Ala Arg Lys Val Gln
        10                       15                       20
Ala Ala Gly Leu Ser Cys Leu Val Leu Glu Ala Met Asp Arg Val Gly
25                       30                       35                       40
Gly Lys Thr Leu Ser Val Gln Ser Gly Pro Gly Arg Thr Thr Ile Asn
                  45                       50                       55
Asp Leu Gly Ala Ala Trp Ile Asn Asp Ser Asn Gln Ser Glu Val Ser
                  60                       65                       70
```

26

```
Arg Leu Phe Glu Arg Phe His Leu Glu Gly Glu Leu Gln Arg Thr Thr
        75                  80                  85
Gly Asn Ser Ile His Gln Ala Gln Asp Gly Thr Thr Thr Thr Ala Pro
    90                  95                  100
Tyr Gly Asp Ser Leu Leu Ser Glu Glu Val Ala Ser Ala Leu Ala Glu
105                 110                 115                     120
Leu Leu Pro Val Trp Ser Gln Leu Ile Glu Glu His Ser Leu Gln Asp
            125                 130                 135
Leu Lys Ala Ser Pro Gln Ala Lys Arg Leu Asp Ser Val Ser Phe Ala
            140                 145                 150
His Tyr Cys Glu Lys Glu Leu Asn Leu Pro Ala Val Leu Gly Val Ala
        155                 160                 165
Asn Gln Ile Thr Arg Ala Leu Leu Gly Val Glu Ala His Glu Ile Ser
    170                 175                 180
Met Leu Phe Leu Thr Asp Tyr Ile Lys Ser Ala Thr Gly Leu Ser Asn
185                 190                 195                     200
Ile Phe Ser Asp Lys Lys Asp Gly Gly Gln Tyr Met Arg Cys Lys Thr
            205                 210                 215
Gly Met Gln Ser Ile Cys His Ala Met Ser Lys Glu Leu Val Pro Gly
        220                 225                 230
Ser Val His Leu Asn Thr Pro Val Ala Glu Ile Glu Gln Ser Ala Ser
        235                 240                 245
Gly Cys Thr Val Arg Ser Ala Ser Gly Ala Val Phe Arg Ser Lys Lys
    250                 255                 260
Val Val Val Ser Leu Pro Thr Thr Leu Tyr Pro Thr Leu Thr Phe Ser
265                 270                 275                     280
Pro Pro Leu Pro Ala Glu Lys Gln Ala Leu Ala Glu Asn Ser Ile Leu
            285                 290                 295
Gly Tyr Tyr Ser Lys Ile Val Phe Val Trp Asp Lys Pro Trp Trp Arg
            300                 305                 310
Glu Gln Gly Phe Ser Gly Val Leu Gln Ser Ser Cys Asp Pro Ile Ser
            315                 320                 325
Phe Ala Arg Asp Thr Ser Ile Asp Val Asp Arg Gln Trp Ser Ile Thr
    330                 335                 340
Cys Phe Met Val Gly Asp Pro Gly Arg Lys Trp Ser Gln Gln Ser Lys
345                 350                 355                     360
Gln Val Arg Gln Lys Ser Val Trp Asp Gln Leu Arg Ala Ala Tyr Glu
            365                 370                 375
Asn Ala Gly Ala Gln Val Pro Glu Pro Ala Asn Val Leu Glu Ile Glu
            380                 385                 390
Trp Ser Lys Gln Gln Tyr Phe Gln Gly Ala Pro Ser Ala Val Tyr Gly
        395                 400                 405
Leu Asn Asp Leu Ile Thr Leu Gly Ser Ala Leu Arg Thr Pro Phe Lys
    410                 415                 420
Ser Val His Phe Val Gly Thr Glu Thr Ser Leu Val Trp Lys Gly Tyr
425                 430                 435                     440
Met Glu Gly Ala Ile Arg Ser Gly Gln Arg Gly Ala Ala Glu Val Val
            445                 450                 455
Ala Ser Leu Val Pro Ala Ala
            460

    <210> 22
    <211> 1803
    <212> DNA
    <213> Exophiala spinifera

    <220>
    <221> CDS
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27

<222> (1)...(1800)

<400> 22

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atg gca ctt gca ccg agc tac atc aat ccc cca aac gtc gcc tcc cca        48
Met Ala Leu Ala Pro Ser Tyr Ile Asn Pro Pro Asn Val Ala Ser Pro
 1               5                  10                  15

gca ggg tat tct cac gtc ggc gta ggc cca gac gga ggg agg tat gtg        96
Ala Gly Tyr Ser His Val Gly Val Gly Pro Asp Gly Gly Arg Tyr Val
                20                  25                  30

aca ata gct gga cag att gga caa gac gct tcg ggc gtg aca gac cct       144
Thr Ile Ala Gly Gln Ile Gly Gln Asp Ala Ser Gly Val Thr Asp Pro
            35                  40                  45

gcc tac gag aaa cag gtt gcc caa gca ttc gcc aat ctg cga gct tgc       192
Ala Tyr Glu Lys Gln Val Ala Gln Ala Phe Ala Asn Leu Arg Ala Cys
        50                  55                  60

ctt gct gca gtt gga gcc act tca aac gac gtc acc aag ctc aat tac       240
Leu Ala Ala Val Gly Ala Thr Ser Asn Asp Val Thr Lys Leu Asn Tyr
 65                  70                  75                  80

tac atc gtc gac tac gcc ccg agc aaa ctc acc gca att gga gat ggg       288
Tyr Ile Val Asp Tyr Ala Pro Ser Lys Leu Thr Ala Ile Gly Asp Gly
                85                  90                  95

ctg aag gct acc ttt gcc ctt gac agg ctc cct cct tgc acg ctg gtg       336
Leu Lys Ala Thr Phe Ala Leu Asp Arg Leu Pro Pro Cys Thr Leu Val
               100                 105                 110

cca gtg tcg gcc ttg tct tca cct gaa tac ctc ttt gag gtt gat gcc       384
Pro Val Ser Ala Leu Ser Ser Pro Glu Tyr Leu Phe Glu Val Asp Ala
           115                 120                 125

acg gcg ctg gtg ccg gga cac acg acc cca gac aac gtt gcg gac gtg       432
Thr Ala Leu Val Pro Gly His Thr Thr Pro Asp Asn Val Ala Asp Val
       130                 135                 140

gta gtg gtg ggc gct ggc ttg agc ggt ttg gag acg gca cgc aaa gtc       480
Val Val Val Gly Ala Gly Leu Ser Gly Leu Glu Thr Ala Arg Lys Val
145                 150                 155                 160

cag gcc gcc ggt ctg tcc tgc ctc gtt ctt gag gcg atg gat cgt gta       528
Gln Ala Ala Gly Leu Ser Cys Leu Val Leu Glu Ala Met Asp Arg Val
               165                 170                 175

ggg gga aag act ctg agc gta caa tcg ggt ccc ggc agg acg act atc       576
Gly Gly Lys Thr Leu Ser Val Gln Ser Gly Pro Gly Arg Thr Thr Ile
           180                 185                 190

aac gac ctc ggc gct gcg tgg atc aat gac agc aac caa agc gaa gta       624
Asn Asp Leu Gly Ala Ala Trp Ile Asn Asp Ser Asn Gln Ser Glu Val
           195                 200                 205

tcc aga ttg ttt gaa aga ttt cat ttg gag ggc gag ctc cag agg acg       672
Ser Arg Leu Phe Glu Arg Phe His Leu Glu Gly Glu Leu Gln Arg Thr
       210                 215                 220
```

28

```
act gga aat tca atc cat caa gca caa gac ggt aca acc act aca gct     720
Thr Gly Asn Ser Ile His Gln Ala Gln Asp Gly Thr Thr Thr Thr Ala
225             230             235             240

cct tat ggt gac tcc ttg ctg agc gag gag gtt gca agt gca ctt gcg     768
Pro Tyr Gly Asp Ser Leu Leu Ser Glu Glu Val Ala Ser Ala Leu Ala
            245             250             255

gaa ctc ctc ccc gta tgg tct cag ctg atc gaa gag cat agc ctt caa     816
Glu Leu Leu Pro Val Trp Ser Gln Leu Ile Glu Glu His Ser Leu Gln
            260             265             270

gac ctc aag gcg agc cct cag gcg aag cgg ctc gac agt gtg agc ttc     864
Asp Leu Lys Ala Ser Pro Gln Ala Lys Arg Leu Asp Ser Val Ser Phe
        275             280             285

gcg cac tac tgt gag aag gaa cta aac ttg cct gct gtt ctc ggc gta     912
Ala His Tyr Cys Glu Lys Glu Leu Asn Leu Pro Ala Val Leu Gly Val
    290             295             300

gca aac cag atc aca cgc gct ctg ctc ggt gtg gaa gcc cac gag atc     960
Ala Asn Gln Ile Thr Arg Ala Leu Leu Gly Val Glu Ala His Glu Ile
305             310             315             320

agc atg ctt ttt ctc acc gac tac atc aag agt gcc acc ggt ctc agt    1008
Ser Met Leu Phe Leu Thr Asp Tyr Ile Lys Ser Ala Thr Gly Leu Ser
            325             330             335

aat att ttc tcg gac aag aaa gac ggc ggg cag tat atg cga tgc aaa    1056
Asn Ile Phe Ser Asp Lys Lys Asp Gly Gly Gln Tyr Met Arg Cys Lys
            340             345             350

aca ggt atg cag tcg att tgc cat gcc atg tca aag gaa ctt gtt cca    1104
Thr Gly Met Gln Ser Ile Cys His Ala Met Ser Lys Glu Leu Val Pro
            355             360             365

ggc tca gtg cac ctc aac acc ccc gtc gct gaa att gag cag tcg gca    1152
Gly Ser Val His Leu Asn Thr Pro Val Ala Glu Ile Glu Gln Ser Ala
    370             375             380

tcc ggc tgt aca gta cga tcg gcc tcg ggc gcc gtg ttc cga agc aaa    1200
Ser Gly Cys Thr Val Arg Ser Ala Ser Gly Ala Val Phe Arg Ser Lys
385             390             395             400

aag gtg gtg gtt tcg tta ccg aca acc ttg tat ccc acc ttg aca ttt    1248
Lys Val Val Val Ser Leu Pro Thr Thr Leu Tyr Pro Thr Leu Thr Phe
            405             410             415

tca cca cct ctt ccc gcc gag aag caa gca ttg gcg gaa aat tct atc    1296
Ser Pro Pro Leu Pro Ala Glu Lys Gln Ala Leu Ala Glu Asn Ser Ile
            420             425             430

ctg ggc tac tat agc aag ata gtc ttc gta tgg gac aag ccg tgg tgg    1344
Leu Gly Tyr Tyr Ser Lys Ile Val Phe Val Trp Asp Lys Pro Trp Trp
            435             440             445

cgc gaa caa ggc ttc tcg ggc gtc ctc caa tcg agc tgt gac ccc atc    1392
```
29

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Arg Glu Gln Gly Phe Ser Gly Val Leu Gln Ser Ser Cys Asp Pro Ile
    450             455             460

tca ttt gcc aga gat acc agc atc gac gtc gat cga caa tgg tcc att      1440
Ser Phe Ala Arg Asp Thr Ser Ile Asp Val Asp Arg Gln Trp Ser Ile
465             470             475             480

acc tgt ttc atg gtc gga gac ccg gga cgg aag tgg tcc caa cag tcc      1488
Thr Cys Phe Met Val Gly Asp Pro Gly Arg Lys Trp Ser Gln Gln Ser
                485             490             495

aag cag gta cga caa aag tct gtc tgg gac caa ctc cgc gca gcc tac      1536
Lys Gln Val Arg Gln Lys Ser Val Trp Asp Gln Leu Arg Ala Ala Tyr
                500             505             510

gag aac gcc ggg gcc caa gtc cca gag ccg gcc aac gtg ctc gaa atc      1584
Glu Asn Ala Gly Ala Gln Val Pro Glu Pro Ala Asn Val Leu Glu Ile
        515             520             525

gag tgg tcg aag cag cag tat ttc caa gga gct ccg agc gcc gtc tat      1632
Glu Trp Ser Lys Gln Gln Tyr Phe Gln Gly Ala Pro Ser Ala Val Tyr
    530             535             540

ggg ctg aac gat ctc atc aca ctg ggt tcg gcg ctc aga acg ccg ttc      1680
Gly Leu Asn Asp Leu Ile Thr Leu Gly Ser Ala Leu Arg Thr Pro Phe
545             550             555             560

aag agt gtt cat ttc gtt gga acg gag acg tct tta gtt tgg aaa ggg      1728
Lys Ser Val His Phe Val Gly Thr Glu Thr Ser Leu Val Trp Lys Gly
                565             570             575

tat atg gaa ggg gcc ata cga tcg ggt caa cga ggt gct gca gaa gtt      1776
Tyr Met Glu Gly Ala Ile Arg Ser Gly Gln Arg Gly Ala Ala Glu Val
                580             585             590

gtg gct agc ctg gtg cca gca gca tag                                  1803
Val Ala Ser Leu Val Pro Ala Ala
        595             600


        <210> 23
        <211> 600
        <212> PRT
        <213> Exophiala spinifera

        <400> 23
Met Ala Leu Ala Pro Ser Tyr Ile Asn Pro Pro Asn Val Ala Ser Pro
 1               5              10              15
Ala Gly Tyr Ser His Val Gly Val Gly Pro Asp Gly Gly Arg Tyr Val
            20              25              30
Thr Ile Ala Gly Gln Ile Gly Gln Asp Ala Ser Gly Val Thr Asp Pro
        35              40              45
Ala Tyr Glu Lys Gln Val Ala Gln Ala Phe Ala Asn Leu Arg Ala Cys
    50              55              60
Leu Ala Ala Val Gly Ala Thr Ser Asn Asp Val Thr Lys Leu Asn Tyr
65              70              75              80
Tyr Ile Val Asp Tyr Ala Pro Ser Lys Leu Thr Ala Ile Gly Asp Gly
            85              90              95
```

```
Leu Lys Ala Thr Phe Ala Leu Asp Arg Leu Pro Pro Cys Thr Leu Val
            100                 105                 110
Pro Val Ser Ala Leu Ser Ser Pro Glu Tyr Leu Phe Glu Val Asp Ala
            115                 120                 125
Thr Ala Leu Val Pro Gly His Thr Thr Pro Asp Asn Val Ala Asp Val
            130                 135                 140
Val Val Val Gly Ala Gly Leu Ser Gly Leu Glu Thr Ala Arg Lys Val
145                 150                 155                 160
Gln Ala Ala Gly Leu Ser Cys Leu Val Leu Glu Ala Met Asp Arg Val
                165                 170                 175
Gly Gly Lys Thr Leu Ser Val Gln Ser Gly Pro Gly Arg Thr Thr Ile
                180                 185                 190
Asn Asp Leu Gly Ala Ala Trp Ile Asn Asp Ser Asn Gln Ser Glu Val
            195                 200                 205
Ser Arg Leu Phe Glu Arg Phe His Leu Glu Gly Glu Leu Gln Arg Thr
            210                 215                 220
Thr Gly Asn Ser Ile His Gln Ala Gln Asp Gly Thr Thr Thr Thr Ala
225                 230                 235                 240
Pro Tyr Gly Asp Ser Leu Leu Ser Glu Glu Val Ala Ser Ala Leu Ala
                245                 250                 255
Glu Leu Leu Pro Val Trp Ser Gln Leu Ile Glu Glu His Ser Leu Gln
                260                 265                 270
Asp Leu Lys Ala Ser Pro Gln Ala Lys Arg Leu Asp Ser Val Ser Phe
                275                 280                 285
Ala His Tyr Cys Glu Lys Glu Leu Asn Leu Pro Ala Val Leu Gly Val
                290                 295                 300
Ala Asn Gln Ile Thr Arg Ala Leu Leu Gly Val Glu Ala His Glu Ile
305                 310                 315                 320
Ser Met Leu Phe Leu Thr Asp Tyr Ile Lys Ser Ala Thr Gly Leu Ser
                325                 330                 335
Asn Ile Phe Ser Asp Lys Lys Asp Gly Gly Gln Tyr Met Arg Cys Lys
                340                 345                 350
Thr Gly Met Gln Ser Ile Cys His Ala Met Ser Lys Glu Leu Val Pro
            355                 360                 365
Gly Ser Val His Leu Asn Thr Pro Val Ala Glu Ile Glu Gln Ser Ala
            370                 375                 380
Ser Gly Cys Thr Val Arg Ser Ala Ser Gly Ala Val Phe Arg Ser Lys
385                 390                 395                 400
Lys Val Val Val Ser Leu Pro Thr Thr Leu Tyr Pro Thr Leu Thr Phe
                405                 410                 415
Ser Pro Pro Leu Pro Ala Glu Lys Gln Ala Leu Ala Glu Asn Ser Ile
                420                 425                 430
Leu Gly Tyr Tyr Ser Lys Ile Val Phe Val Trp Asp Lys Pro Trp Trp
            435                 440                 445
Arg Glu Gln Gly Phe Ser Gly Val Leu Gln Ser Ser Cys Asp Pro Ile
            450                 455                 460
Ser Phe Ala Arg Asp Thr Ser Ile Asp Val Asp Arg Gln Trp Ser Ile
465                 470                 475                 480
Thr Cys Phe Met Val Gly Asp Pro Gly Arg Lys Trp Ser Gln Gln Ser
                485                 490                 495
Lys Gln Val Arg Gln Lys Ser Val Trp Asp Gln Leu Arg Ala Ala Tyr
                500                 505                 510
Glu Asn Ala Gly Ala Gln Val Pro Glu Pro Ala Asn Val Leu Glu Ile
                515                 520                 525
Glu Trp Ser Lys Gln Gln Tyr Phe Gln Gly Ala Pro Ser Ala Val Tyr
            530                 535                 540
Gly Leu Asn Asp Leu Ile Thr Leu Gly Ser Ala Leu Arg Thr Pro Phe
545                 550                 555                 560
```

31

```
Lys Ser Val His Phe Val Gly Thr Glu Thr Ser Leu Val Trp Lys Gly
                565             570             575
Tyr Met Glu Gly Ala Ile Arg Ser Gly Gln Arg Gly Ala Ala Glu Val
                580             585             590
Val Ala Ser Leu Val Pro Ala Ala
            595             600
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        <213> Unknown

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              esp1 mat: an artificial spacer sequence and
              K:trAPAO

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        <223> Barley alpha amylase signal sequence

        <221> misc_feature
        <222> (73)...(1575)
        <223> esp1 mat

        <221> misc_feature
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        <223> spacer sequence

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        <222> (1612)...(3000)
        <223> K:trAPAO

        <221> CDS
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        <222> (1612)...(1614)
        <223> Extra lysine

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atg gcc aac aag cac ctg agc ctc tcc ctc ttc ctc gtg ctc ctc ggc      48
Met Ala Asn Lys His Leu Ser Leu Ser Leu Phe Leu Val Leu Leu Gly
            -20             -15             -10

ctc tcc gcc tcc ctc gcc agc ggc gct cct act gtc aag att gat gct      96
Leu Ser Ala Ser Leu Ala Ser Gly Ala Pro Thr Val Lys Ile Asp Ala
            -5              1               5

ggg atg gtg gtc ggc acg act act act gtc ccc ggc acc act gcg acc     144
Gly Met Val Val Gly Thr Thr Thr Thr Val Pro Gly Thr Thr Ala Thr
    10              15              20

gtc agc gag ttc ttg ggc gtt cct ttt gcc gcc tct ccg aca cga ttt     192
Val Ser Glu Phe Leu Gly Val Pro Phe Ala Ala Ser Pro Thr Arg Phe
 25              30              35              40
```

                                    32

```
gcg cct cct act cgt ccc gtg cct tgg tca acg cct ttg caa gcc act       240
Ala Pro Pro Thr Arg Pro Val Pro Trp Ser Thr Pro Leu Gln Ala Thr
                45                  50                  55

gca tat ggt cca gca tgc cct caa caa ttc aat tac ccc gaa gaa ctc       288
Ala Tyr Gly Pro Ala Cys Pro Gln Gln Phe Asn Tyr Pro Glu Glu Leu
                60                  65                  70

cgt gag att acg atg gcc tgg ttc aat aca ccg ccc ccg tca gct ggt       336
Arg Glu Ile Thr Met Ala Trp Phe Asn Thr Pro Pro Pro Ser Ala Gly
            75                  80                  85

gaa agt gag gac tgc ctg aac ctc aac atc tac gtc cca gga act gag       384
Glu Ser Glu Asp Cys Leu Asn Leu Asn Ile Tyr Val Pro Gly Thr Glu
            90                  95                  100

aac aca aac aaa gcc gtc atg gtt tgg ata tac ggt gga gcg ctg gaa       432
Asn Thr Asn Lys Ala Val Met Val Trp Ile Tyr Gly Gly Ala Leu Glu
105                 110                 115                 120

tat ggt tgg aat tca ttc cac ctt tac gac ggg gct agt ttc gca gcc       480
Tyr Gly Trp Asn Ser Phe His Leu Tyr Asp Gly Ala Ser Phe Ala Ala
                125                 130                 135

aat cag gat gtc atc gcc gtg acc atc aac tac aga acg aac att ctg       528
Asn Gln Asp Val Ile Ala Val Thr Ile Asn Tyr Arg Thr Asn Ile Leu
                140                 145                 150

ggg ttc cct gct gcc cct cag ctt cca ata aca cag cga aat ctg ggg       576
Gly Phe Pro Ala Ala Pro Gln Leu Pro Ile Thr Gln Arg Asn Leu Gly
                155                 160                 165

ttc cta gac caa agg ttt gct ttg gat tgg gta cag cgg aac atc gca       624
Phe Leu Asp Gln Arg Phe Ala Leu Asp Trp Val Gln Arg Asn Ile Ala
            170                 175                 180

gcc ttt ggc ggt gat cct cga aag gtc aca ata ttt ggg cag agt gcg       672
Ala Phe Gly Gly Asp Pro Arg Lys Val Thr Ile Phe Gly Gln Ser Ala
185                 190                 195                 200

ggg ggc aga agt gtc gac gtc ctc ttg acg tct atg cca cac aac cca       720
Gly Gly Arg Ser Val Asp Val Leu Leu Thr Ser Met Pro His Asn Pro
                205                 210                 215

ccc ttc cga gca gca atc atg gag tcc ggt gtg gct aac tac aac ttc       768
Pro Phe Arg Ala Ala Ile Met Glu Ser Gly Val Ala Asn Tyr Asn Phe
                220                 225                 230

ccc aag gga gat ttg tcc gaa cct tgg aac acc act gtt caa gct ctc       816
Pro Lys Gly Asp Leu Ser Glu Pro Trp Asn Thr Thr Val Gln Ala Leu
                235                 240                 245

aac tgt acc acc agt atc gac atc ttg agt tgt atg aga aga gtc gat       864
Asn Cys Thr Thr Ser Ile Asp Ile Leu Ser Cys Met Arg Arg Val Asp
                250                 255                 260

ctc gcc act ctg atg aac acg atc gag caa ctc gga ctt ggg ttt gag       912
Leu Ala Thr Leu Met Asn Thr Ile Glu Gln Leu Gly Leu Gly Phe Glu
```
33

tac acg ttg gac aac gta acg gct gtg tac cgt tct gaa acg gct cgc   960
Tyr Thr Leu Asp Asn Val Thr Ala Val Tyr Arg Ser Glu Thr Ala Arg
            285   290   295

acg act ggt gac att gct cgt gta cct gtt ctc gtc ggg acg gtg gcc   1008
Thr Thr Gly Asp Ile Ala Arg Val Pro Val Leu Val Gly Thr Val Ala
            300   305   310

aac gac gga ctt ctc ttt gtc ctc ggg gag aat gac acc caa gca tat   1056
Asn Asp Gly Leu Leu Phe Val Leu Gly Glu Asn Asp Thr Gln Ala Tyr
            315   320   325

ctc gag gag gca atc ccg aat cag ccc gac ctt tac cag act ctc ctt   1104
Leu Glu Glu Ala Ile Pro Asn Gln Pro Asp Leu Tyr Gln Thr Leu Leu
            330   335   340

gga gca tat ccc att gga tcc cca ggg atc gga tcg cct caa gat cag   1152
Gly Ala Tyr Pro Ile Gly Ser Pro Gly Ile Gly Ser Pro Gln Asp Gln
345   350   355   360

att gcc gcc att gag acc gag gta aga ttc cag tgt cct tct gcc atc   1200
Ile Ala Ala Ile Glu Thr Glu Val Arg Phe Gln Cys Pro Ser Ala Ile
            365   370   375

gtg gct cag gac tcc cgg aat cgg ggt atc cct tct tgg cgc tac tac   1248
Val Ala Gln Asp Ser Arg Asn Arg Gly Ile Pro Ser Trp Arg Tyr Tyr
            380   385   390

tac aat gcg acc ttt gag aat ctg gag ctt ttc cct ggg tcc gaa gtg   1296
Tyr Asn Ala Thr Phe Glu Asn Leu Glu Leu Phe Pro Gly Ser Glu Val
            395   400   405

tac cac agc tct gaa gtc ggg atg gtg ttt ggc acg tat cct gtc gca   1344
Tyr His Ser Ser Glu Val Gly Met Val Phe Gly Thr Tyr Pro Val Ala
            410   415   420

agt gcg acc gcc ttg gag gcc cag acg agc aaa tac atg cag ggt gcc   1392
Ser Ala Thr Ala Leu Glu Ala Gln Thr Ser Lys Tyr Met Gln Gly Ala
425   430   435   440

tgg gcg gcc ttt gcc aaa aac ccc atg aat ggg cct ggg tgg aaa caa   1440
Trp Ala Ala Phe Ala Lys Asn Pro Met Asn Gly Pro Gly Trp Lys Gln
            445   450   455

gtg ccg aat gtc gcg gcg ctt ggc tca cca ggc aaa gcc atc cag gtt   1488
Val Pro Asn Val Ala Ala Leu Gly Ser Pro Gly Lys Ala Ile Gln Val
            460   465   470

gac gtc tct cca gcg aca ata gac caa cga tgt gcc ttg tac acg cgt   1536
Asp Val Ser Pro Ala Thr Ile Asp Gln Arg Cys Ala Leu Tyr Thr Arg
            475   480   485

tat tat act gag ttg ggc aca atc gcg ccg agg aca ttt ggc gga ggc   1584
Tyr Tyr Thr Glu Leu Gly Thr Ile Ala Pro Arg Thr Phe Gly Gly Gly
            490   495   500

34

agc ggc gga ggc agc ggc gga ggc agc aaa gac aac gtt gcg gac gtg   1632
Ser Gly Gly Gly Ser Gly Gly Gly Ser Lys Asp Asn Val Ala Asp Val
505   510   515   520

gta gtg gtg ggc gct ggc ttg agc ggt ttg gag acg gca cgc aaa gtc   1680
Val Val Val Gly Ala Gly Leu Ser Gly Leu Glu Thr Ala Arg Lys Val
            525   530   535

cag gcc gcc ggt ctg tcc tgc ctc gtt ctt gag gcg atg gat cgt gta   1728
Gln Ala Ala Gly Leu Ser Cys Leu Val Leu Glu Ala Met Asp Arg Val
            540   545   550

ggg gga aag act ctg agc gta caa tcg ggt ccc ggc agg acg act atc   1776
Gly Gly Lys Thr Leu Ser Val Gln Ser Gly Pro Gly Arg Thr Thr Ile
            555   560   565

aac gac ctc ggc gct gcg tgg atc aat gac agc aac caa agc gaa gta   1824
Asn Asp Leu Gly Ala Ala Trp Ile Asn Asp Ser Asn Gln Ser Glu Val
            570   575   580

tcc aga ttg ttt gaa aga ttt cat ttg gag ggc gag ctc cag agg acg   1872
Ser Arg Leu Phe Glu Arg Phe His Leu Glu Gly Glu Leu Gln Arg Thr
585   590   595   600

act gga aat tca atc cat caa gca caa gac ggt aca acc act aca gct   1920
Thr Gly Asn Ser Ile His Gln Ala Gln Asp Gly Thr Thr Thr Thr Ala
            605   610   615

cct tat ggt gac tcc ttg ctg agc gag gag gtt gca agt gca ctt gcg   1968
Pro Tyr Gly Asp Ser Leu Leu Ser Glu Glu Val Ala Ser Ala Leu Ala
            620   625   630

gaa ctc ctc ccc gta tgg tct cag ctg atc gaa gag cat agc ctt caa   2016
Glu Leu Leu Pro Val Trp Ser Gln Leu Ile Glu Glu His Ser Leu Gln
            635   640   645

gac ctc aag gcg agc cct cag gcg aag cgg ctc gac agt gtg agc ttc   2064
Asp Leu Lys Ala Ser Pro Gln Ala Lys Arg Leu Asp Ser Val Ser Phe
            650   655   660

gcg cac tac tgt gag aag gaa cta aac ttg cct gct gtt ctc ggc gta   2112
Ala His Tyr Cys Glu Lys Glu Leu Asn Leu Pro Ala Val Leu Gly Val
665   670   675   680

gca aac cag atc aca cgc gct ctg ctc ggt gtg gaa gcc cac gag atc   2160
Ala Asn Gln Ile Thr Arg Ala Leu Leu Gly Val Glu Ala His Glu Ile
            685   690   695

agc atg ctt ttt ctc acc gac tac atc aag agt gcc acc ggt ctc agt   2208
Ser Met Leu Phe Leu Thr Asp Tyr Ile Lys Ser Ala Thr Gly Leu Ser
            700   705   710

aat att ttc tcg gac aag aaa gac ggc ggg cag tat atg cga tgc aaa   2256
Asn Ile Phe Ser Asp Lys Lys Asp Gly Gly Gln Tyr Met Arg Cys Lys
            715   720   725

aca ggt atg cag tcg att tgc cat gcc atg tca aag gaa ctt gtt cca   2304
Thr Gly Met Gln Ser Ile Cys His Ala Met Ser Lys Glu Leu Val Pro

35

ggc tca gtg cac ctc aac acc ccc gtc gct gaa att gag cag tcg gca   2352
Gly Ser Val His Leu Asn Thr Pro Val Ala Glu Ile Glu Gln Ser Ala
745   750   755   760

tcc ggc tgt aca gta cga tcg gcc tcg ggc gcc gtg ttc cga agc aaa   2400
Ser Gly Cys Thr Val Arg Ser Ala Ser Gly Ala Val Phe Arg Ser Lys
                        765   770   775

aag gtg gtg gtt tcg tta ccg aca acc ttg tat ccc acc ttg aca ttt   2448
Lys Val Val Val Ser Leu Pro Thr Thr Leu Tyr Pro Thr Leu Thr Phe
                780   785   790

tca cca cct ctt ccc gcc gag aag caa gca ttg gcg gaa aat tct atc   2496
Ser Pro Pro Leu Pro Ala Glu Lys Gln Ala Leu Ala Glu Asn Ser Ile

            795   800   805

ctg ggc tac tat agc aag ata gtc ttc gta tgg gac aag ccg tgg tgg   2544
Leu Gly Tyr Tyr Ser Lys Ile Val Phe Val Trp Asp Lys Pro Trp Trp
    810   815   820

cgc gaa caa ggc ttc tcg ggc gtc ctc caa tcg agc tgt gac ccc atc   2592
Arg Glu Gln Gly Phe Ser Gly Val Leu Gln Ser Ser Cys Asp Pro Ile
825   830   835   840

tca ttt gcc aga gat acc agc atc gac gtc gat cga caa tgg tcc att   2640
Ser Phe Ala Arg Asp Thr Ser Ile Asp Val Asp Arg Gln Trp Ser Ile
                845   850   855

acc tgt ttc atg gtc gga gac ccg gga cgg aag tgg tcc caa cag tcc   2688
Thr Cys Phe Met Val Gly Asp Pro Gly Arg Lys Trp Ser Gln Gln Ser
                860   865   870

aag cag gta cga caa aag tct gtc tgg gac caa ctc cgc gca gcc tac   2736
Lys Gln Val Arg Gln Lys Ser Val Trp Asp Gln Leu Arg Ala Ala Tyr
            875   880   885

gag aac gcc ggg gcc caa gtc cca gag ccg gcc aac gtg ctc gaa atc   2784
Glu Asn Ala Gly Ala Gln Val Pro Glu Pro Ala Asn Val Leu Glu Ile
    890   895   900

gag tgg tcg aag cag cag tat ttc caa gga gct ccg agc gcc gtc tat   2832
Glu Trp Ser Lys Gln Gln Tyr Phe Gln Gly Ala Pro Ser Ala Val Tyr
905   910   915   920

ggg ctg aac gat ctc atc aca ctg ggt tcg gcg ctc aga acg ccg ttc   2880
Gly Leu Asn Asp Leu Ile Thr Leu Gly Ser Ala Leu Arg Thr Pro Phe
                925   930   935

aag agt gtt cat ttc gtt gga acg gag acg tct tta gtt tgg aaa ggg   2928
Lys Ser Val His Phe Val Gly Thr Glu Thr Ser Leu Val Trp Lys Gly
            940   945   950

tat atg gaa ggg gcc ata cga tcg ggt caa cga ggt gct gca gaa gtt   2976
Tyr Met Glu Gly Ala Ile Arg Ser Gly Gln Arg Gly Ala Ala Glu Val
        955   960   965

36

```
gtg gct agc ctg gtg cca gca gca tag                                    3003
Val Ala Ser Leu Val Pro Ala Ala
970                     975


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     <213> Unknown

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Met Ala Asn Lys His Leu Ser Leu Ser Leu Phe Leu Val Leu Leu Gly
              -20                 -15                 -10
Leu Ser Ala Ser Leu Ala Ser Gly Ala Pro Thr Val Lys Ile Asp Ala
              -5                  1                   5
Gly Met Val Val Gly Thr Thr Thr Thr Val Pro Gly Thr Thr Ala Thr
    10                  15                  20
Val Ser Glu Phe Leu Gly Val Pro Phe Ala Ala Ser Pro Thr Arg Phe
25                  30                  35                  40
Ala Pro Pro Thr Arg Pro Val Pro Trp Ser Thr Pro Leu Gln Ala Thr
              45                  50                  55
Ala Tyr Gly Pro Ala Cys Pro Gln Gln Phe Asn Tyr Pro Glu Glu Leu
              60                  65                  70
Arg Glu Ile Thr Met Ala Trp Phe Asn Thr Pro Pro Pro Ser Ala Gly
          75                  80                  85
Glu Ser Glu Asp Cys Leu Asn Leu Asn Ile Tyr Val Pro Gly Thr Glu
    90                  95                  100
Asn Thr Asn Lys Ala Val Met Val Trp Ile Tyr Gly Gly Ala Leu Glu
105                 110                 115                 120
Tyr Gly Trp Asn Ser Phe His Leu Tyr Asp Gly Ala Ser Phe Ala Ala
              125                 130                 135
Asn Gln Asp Val Ile Ala Val Thr Ile Asn Tyr Arg Thr Asn Ile Leu
              140                 145                 150
Gly Phe Pro Ala Ala Pro Gln Leu Pro Ile Thr Gln Arg Asn Leu Gly
          155                 160                 165
Phe Leu Asp Gln Arg Phe Ala Leu Asp Trp Val Gln Arg Asn Ile Ala
    170                 175                 180
Ala Phe Gly Gly Asp Pro Arg Lys Val Thr Ile Phe Gly Gln Ser Ala
185                 190                 195                 200
Gly Gly Arg Ser Val Asp Val Leu Leu Thr Ser Met Pro His Asn Pro
              205                 210                 215
Pro Phe Arg Ala Ala Ile Met Glu Ser Gly Val Ala Asn Tyr Asn Phe
              220                 225                 230
Pro Lys Gly Asp Leu Ser Glu Pro Trp Asn Thr Thr Val Gln Ala Leu
              235                 240                 245
Asn Cys Thr Thr Ser Ile Asp Ile Leu Ser Cys Met Arg Arg Val Asp
    250                 255                 260
Leu Ala Thr Leu Met Asn Thr Ile Glu Gln Leu Gly Leu Gly Phe Glu
265                 270                 275                 280
Tyr Thr Leu Asp Asn Val Thr Ala Val Tyr Arg Ser Glu Thr Ala Arg
              285                 290                 295
Thr Thr Gly Asp Ile Ala Arg Val Pro Val Leu Val Gly Thr Val Ala
              300                 305                 310
```

```
Asn Asp Gly Leu Leu Phe Val Leu Gly Glu Asn Asp Thr Gln Ala Tyr
        315                 320                 325
Leu Glu Glu Ala Ile Pro Asn Gln Pro Asp Leu Tyr Gln Thr Leu Leu
        330                 335                 340
Gly Ala Tyr Pro Ile Gly Ser Pro Gly Ile Gly Ser Pro Gln Asp Gln
345                 350                 355                 360
Ile Ala Ala Ile Glu Thr Glu Val Arg Phe Gln Cys Pro Ser Ala Ile
                365                 370                 375
Val Ala Gln Asp Ser Arg Asn Arg Gly Ile Pro Ser Trp Arg Tyr Tyr
            380                 385                 390
Tyr Asn Ala Thr Phe Glu Asn Leu Glu Leu Phe Pro Gly Ser Glu Val
        395                 400                 405
Tyr His Ser Ser Glu Val Gly Met Val Phe Gly Thr Tyr Pro Val Ala
    410                 415                 420
Ser Ala Thr Ala Leu Glu Ala Gln Thr Ser Lys Tyr Met Gln Gly Ala
425                 430                 435                 440
Trp Ala Ala Phe Ala Lys Asn Pro Met Asn Gly Pro Gly Trp Lys Gln
                445                 450                 455
Val Pro Asn Val Ala Ala Leu Gly Ser Pro Gly Lys Ala Ile Gln Val
            460                 465                 470
Asp Val Ser Pro Ala Thr Ile Asp Gln Arg Cys Ala Leu Tyr Thr Arg
        475                 480                 485
Tyr Tyr Thr Glu Leu Gly Thr Ile Ala Pro Arg Thr Phe Gly Gly Gly
        490                 495                 500
Ser Gly Gly Gly Ser Gly Gly Gly Ser Lys Asp Asn Val Ala Asp Val
505                 510                 515                 520
Val Val Val Gly Ala Gly Leu Ser Gly Leu Glu Thr Ala Arg Lys Val
            525                 530                 535
Gln Ala Ala Gly Leu Ser Cys Leu Val Leu Glu Ala Met Asp Arg Val
        540                 545                 550
Gly Gly Lys Thr Leu Ser Val Gln Ser Gly Pro Gly Arg Thr Thr Ile
        555                 560                 565
Asn Asp Leu Gly Ala Ala Trp Ile Asn Asp Ser Asn Gln Ser Glu Val
    570                 575                 580
Ser Arg Leu Phe Glu Arg Phe His Leu Glu Gly Glu Leu Gln Arg Thr
585                 590                 595                 600
Thr Gly Asn Ser Ile His Gln Ala Gln Asp Gly Thr Thr Thr Thr Ala
                605                 610                 615
Pro Tyr Gly Asp Ser Leu Leu Ser Glu Glu Val Ala Ser Ala Leu Ala
            620                 625                 630
Glu Leu Leu Pro Val Trp Ser Gln Leu Ile Glu Glu His Ser Leu Gln
        635                 640                 645
Asp Leu Lys Ala Ser Pro Gln Ala Lys Arg Leu Asp Ser Val Ser Phe
    650                 655                 660
Ala His Tyr Cys Glu Lys Glu Leu Asn Leu Pro Ala Val Leu Gly Val
665                 670                 675                 680
Ala Asn Gln Ile Thr Arg Ala Leu Leu Gly Val Glu Ala His Glu Ile
                685                 690                 695
Ser Met Leu Phe Leu Thr Asp Tyr Ile Lys Ser Ala Thr Gly Leu Ser
            700                 705                 710
Asn Ile Phe Ser Asp Lys Lys Asp Gly Gly Gln Tyr Met Arg Cys Lys
        715                 720                 725
Thr Gly Met Gln Ser Ile Cys His Ala Met Ser Lys Glu Leu Val Pro
    730                 735                 740
Gly Ser Val His Leu Asn Thr Pro Val Ala Glu Ile Glu Gln Ser Ala
745                 750                 755                 760
Ser Gly Cys Thr Val Arg Ser Ala Ser Gly Ala Val Phe Arg Ser Lys
            765                 770                 775
```

38

```
Lys Val Val Val Ser Leu Pro Thr Thr Leu Tyr Pro Thr Leu Thr Phe
            780                 785             790
Ser Pro Pro Leu Pro Ala Glu Lys Gln Ala Leu Ala Glu Asn Ser Ile
        795             800             805
Leu Gly Tyr Tyr Ser Lys Ile Val Phe Val Trp Asp Lys Pro Trp Trp
    810             815             820
Arg Glu Gln Gly Phe Ser Gly Val Leu Gln Ser Ser Cys Asp Pro Ile
825             830             835             840
Ser Phe Ala Arg Asp Thr Ser Ile Asp Val Asp Arg Gln Trp Ser Ile
            845             850             855
Thr Cys Phe Met Val Gly Asp Pro Gly Arg Lys Trp Ser Gln Gln Ser
            860             865             870
Lys Gln Val Arg Gln Lys Ser Val Trp Asp Gln Leu Arg Ala Ala Tyr
        875             880             885
Glu Asn Ala Gly Ala Gln Val Pro Glu Pro Ala Asn Val Leu Glu Ile
    890             895             900
Glu Trp Ser Lys Gln Gln Tyr Phe Gln Gly Ala Pro Ser Ala Val Tyr
905             910             915             920
Gly Leu Asn Asp Leu Ile Thr Leu Gly Ser Ala Leu Arg Thr Pro Phe
            925             930             935
Lys Ser Val His Phe Val Gly Thr Glu Thr Ser Leu Val Trp Lys Gly
            940             945             950
Tyr Met Glu Gly Ala Ile Arg Ser Gly Gln Arg Gly Ala Ala Glu Val
    955             960             965
Val Ala Ser Leu Val Pro Ala Ala
    970             975


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        <212> DNA
        <213> Unknown

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              plant expression.


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        <223> Barley alpha amylase signal sequence

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        <222> (1546)...(1584)
        <223> spacer sequence

        <221> misc_feature
        <222> (1585)...(2973)
        <223> K:trAPAO

        <221> CDS
        <222> (1)...(2973)

        <221> misc_feature
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<400> 26

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atg gcc aac aag cac ctg agc ctc tcc ctc ttc ctc gtg ctc ctc ggc          48
Met Ala Asn Lys His Leu Ser Leu Ser Leu Phe Leu Val Leu Leu Gly
            -20              -15                    -10

ctc tcc gcc tcc ctc gcc agc ggc acg gat ttt ccg gtc cgc agg acc          96
Leu Ser Ala Ser Leu Ala Ser Gly Thr Asp Phe Pro Val Arg Arg Thr
                -5                  1                  5

gat ctg ggc cag gtt cag gga ctg gcc ggg gac gtg atg agc ttt cgc          144
Asp Leu Gly Gln Val Gln Gly Leu Ala Gly Asp Val Met Ser Phe Arg
        10                  15                  20

gga ata ccc tat gca gcg ccg ccg gtg ggc ggg ctg cgt tgg aag ccg          192
Gly Ile Pro Tyr Ala Ala Pro Pro Val Gly Gly Leu Arg Trp Lys Pro
25                  30                  35                  40

ccc caa cac gcc cgg ccc tgg gcg ggc gtt cgc ccc gcc acc caa ttt          240
Pro Gln His Ala Arg Pro Trp Ala Gly Val Arg Pro Ala Thr Gln Phe
                45                  50                  55

ggc tcc gac tgc ttc ggc gcg gcc tat ctt cgc aaa ggc agc ctc gcc          288
Gly Ser Asp Cys Phe Gly Ala Ala Tyr Leu Arg Lys Gly Ser Leu Ala
                60                  65                  70

ccc ggc gtg agc gag gac tgt ctt tac ctc aac gta tgg gcg ccg tca          336
Pro Gly Val Ser Glu Asp Cys Leu Tyr Leu Asn Val Trp Ala Pro Ser
            75                  80                  85

ggc gct aaa ccc ggc cag tac ccc gtc atg gtc tgg gtc tac ggc ggc          384
Gly Ala Lys Pro Gly Gln Tyr Pro Val Met Val Trp Val Tyr Gly Gly
        90                  95                  100

ggc ttc gcc ggc ggc acg gcc gcc atg ccc tac tac gac ggc gag gcg          432
Gly Phe Ala Gly Gly Thr Ala Ala Met Pro Tyr Tyr Asp Gly Glu Ala
105                 110                 115                 120

ctt gcg cga cag ggc gtc gtc gtg gtg acg ttt aac tat cgg acg aac          480
Leu Ala Arg Gln Gly Val Val Val Val Thr Phe Asn Tyr Arg Thr Asn
                125                 130                 135

atc ctg ggc ttt ttc gcc cat cct ggt ctc tcg cgc gag agc ccc acc          528
Ile Leu Gly Phe Phe Ala His Pro Gly Leu Ser Arg Glu Ser Pro Thr
                140                 145                 150

gga act tcg ggc aac tac ggc cta ctc gac att ctc gcc gct ctt cgg          576
Gly Thr Ser Gly Asn Tyr Gly Leu Leu Asp Ile Leu Ala Ala Leu Arg
                155                 160                 165

tgg gtg cag agc aac gcc cgc gcc ttc gga ggg gac ccc ggc cga gtg          624
Trp Val Gln Ser Asn Ala Arg Ala Phe Gly Gly Asp Pro Gly Arg Val
        170                 175                 180

acg gtc ttt ggt gaa tcg gcc gga gcg agc gcg atc gga ctt ctg ctc          672
```

40

```
Thr Val Phe Gly Glu Ser Ala Gly Ala Ser Ala Ile Gly Leu Leu Leu
185                 190                 195                 200

acc tcg ccg ctg agc aag ggt ctc ttc cgt ggc gct atc ctc gaa agt      720
Thr Ser Pro Leu Ser Lys Gly Leu Phe Arg Gly Ala Ile Leu Glu Ser
                205                 210                 215

cca ggg ctg acg cga ccg ctc gcg acg ctc gcc gac agc gcc gcc tcg      768
Pro Gly Leu Thr Arg Pro Leu Ala Thr Leu Ala Asp Ser Ala Ala Ser
                220                 225                 230

ggc gag cgc ctc gac gcc gat ctt tcg cga ctg cgc tcg acc gac cca      816
Gly Glu Arg Leu Asp Ala Asp Leu Ser Arg Leu Arg Ser Thr Asp Pro
            235                 240                 245

gcc acc ctg atg gcg cgc gcc gac gcg gcc cgc ccg gca tcg cgg gac      864
Ala Thr Leu Met Ala Arg Ala Asp Ala Ala Arg Pro Ala Ser Arg Asp
            250                 255                 260

ctg cgc agg ccg cgt ccg acc gga ccg atc gtc gat ggc cat gtg ctg      912
Leu Arg Arg Pro Arg Pro Thr Gly Pro Ile Val Asp Gly His Val Leu
265                 270                 275                 280

ccg cag acc gac agc gcg gcg atc gcg gcg ggg cag ctg gcg ccg gtt      960
Pro Gln Thr Asp Ser Ala Ala Ile Ala Ala Gly Gln Leu Ala Pro Val
                285                 290                 295

cgg gtc ctg atc gga acc aat gcc gac gaa ggc cgc gcc ttc ctc ggg     1008
Arg Val Leu Ile Gly Thr Asn Ala Asp Glu Gly Arg Ala Phe Leu Gly
                300                 305                 310

cgc gcg ccg atg gag acg cca gcg gac tac caa gcc tat ctg gag gcg     1056
Arg Ala Pro Met Glu Thr Pro Ala Asp Tyr Gln Ala Tyr Leu Glu Ala
            315                 320                 325

cag ttt ggc gac caa gcc gcc gcc gtg gcg gcg tgc tat ccc ctc gac     1104
Gln Phe Gly Asp Gln Ala Ala Ala Val Ala Ala Cys Tyr Pro Leu Asp
            330                 335                 340

ggc cgg gcc acg ccc aag gaa atg gtc gcg cgc atc ttc ggc gac aat     1152
Gly Arg Ala Thr Pro Lys Glu Met Val Ala Arg Ile Phe Gly Asp Asn
345                 350                 355                 360

cag ttc aat cgg ggg gtc tcg gcc ttc tcg gaa gcg ctt gtg cgc cag     1200
Gln Phe Asn Arg Gly Val Ser Ala Phe Ser Glu Ala Leu Val Arg Gln
                365                 370                 375

ggc gcg ccc gtg tgg cgt tat cag ttc aac ggt aat acc gag ggt gga     1248
Gly Ala Pro Val Trp Arg Tyr Gln Phe Asn Gly Asn Thr Glu Gly Gly
                380                 385                 390

aga gcg ccg gct acc cac gga gcc gaa att ccc tac gtt ttc ggg gtg     1296
Arg Ala Pro Ala Thr His Gly Ala Glu Ile Pro Tyr Val Phe Gly Val
                395                 400                 405

ttc aag ctc gac gag ttg ggt ctg ttc gat tgg ccg ccc gag ggg ccc     1344
Phe Lys Leu Asp Glu Leu Gly Leu Phe Asp Trp Pro Pro Glu Gly Pro
            410                 415                 420
```

41

```
acg ccc gcc gac cgt gcg ctg ggc caa ctg atg tcc tcc gcc tgg gtc    1392
Thr Pro Ala Asp Arg Ala Leu Gly Gln Leu Met Ser Ser Ala Trp Val
425             430             435                 440

cgg ttc gcc aag aat ggc gac ccc gcc ggg gac gcc ctt acc tgg cct    1440
Arg Phe Ala Lys Asn Gly Asp Pro Ala Gly Asp Ala Leu Thr Trp Pro
                445             450                 455

gcc tat tct acg ggc aag tcg acc atg aca ttc ggt ccc gag ggc cgc    1488
Ala Tyr Ser Thr Gly Lys Ser Thr Met Thr Phe Gly Pro Glu Gly Arg
                460             465             470

gcg gcg gtg gtg tcg ccc gga cct tcc atc ccc cct tgc gcg gat ggc    1536
Ala Ala Val Val Ser Pro Gly Pro Ser Ile Pro Pro Cys Ala Asp Gly
            475             480             485

gcc aag gcg ggg ggc gga ggc agc ggc gga ggc agc ggc gga ggc agc    1584
Ala Lys Ala Gly Gly Gly Gly Ser Gly Gly Gly Ser Gly Gly Gly Ser
        490             495             500

aaa gac aac gtt gcg gac gtg gta gtg gtg ggc gct ggc ttg agc ggt    1632
Lys Asp Asn Val Ala Asp Val Val Val Val Gly Ala Gly Leu Ser Gly
505             510             515                 520

ttg gag acg gca cgc aaa gtc cag gcc gcc ggt ctg tcc tgc ctc gtt    1680
Leu Glu Thr Ala Arg Lys Val Gln Ala Ala Gly Leu Ser Cys Leu Val
                525             530             535

ctt gag gcg atg gat cgt gta ggg gga aag act ctg agc gta caa tcg    1728
Leu Glu Ala Met Asp Arg Val Gly Gly Lys Thr Leu Ser Val Gln Ser
            540             545             550

ggt ccc ggc agg acg act atc aac gac ctc ggc gct gcg tgg atc aat    1776
Gly Pro Gly Arg Thr Thr Ile Asn Asp Leu Gly Ala Ala Trp Ile Asn
        555             560             565

gac agc aac caa agc gaa gta tcc aga ttg ttt gaa aga ttt cat ttg    1824
Asp Ser Asn Gln Ser Glu Val Ser Arg Leu Phe Glu Arg Phe His Leu
        570             575             580

gag ggc gag ctc cag agg acg act gga aat tca atc cat caa gca caa    1872
Glu Gly Glu Leu Gln Arg Thr Thr Gly Asn Ser Ile His Gln Ala Gln
585             590             595                 600

gac ggt aca acc act aca gct cct tat ggt gac tcc ttg ctg agc gag    1920
Asp Gly Thr Thr Thr Thr Ala Pro Tyr Gly Asp Ser Leu Leu Ser Glu
                605             610             615

gag gtt gca agt gca ctt gcg gaa ctc ctc ccc gta tgg tct cag ctg    1968
Glu Val Ala Ser Ala Leu Ala Glu Leu Leu Pro Val Trp Ser Gln Leu
            620             625             630

atc gaa gag cat agc ctt caa gac ctc aag gcg agc cct cag gcg aag    2016
Ile Glu Glu His Ser Leu Gln Asp Leu Lys Ala Ser Pro Gln Ala Lys
            635             640             645

cgg ctc gac agt gtg agc ttc gcg cac tac tgt gag aag gaa cta aac    2064
                            42
```

```
Arg Leu Asp Ser Val Ser Phe Ala His Tyr Cys Glu Lys Glu Leu Asn
    650                 655                 660

ttg cct gct gtt ctc ggc gta gca aac cag atc aca cgc gct ctg ctc        2112
Leu Pro Ala Val Leu Gly Val Ala Asn Gln Ile Thr Arg Ala Leu Leu
665                 670                 675                 ·680

ggt gtg gaa gcc cac gag atc agc atg ctt ttt ctc acc gac tac atc        2160
Gly Val Glu Ala His Glu Ile Ser Met Leu Phe Leu Thr Asp Tyr Ile
                685                 690                 695

aag agt gcc acc ggt ctc agt aat att ttc tcg gac aag aaa gac ggc        2208
Lys Ser Ala Thr Gly Leu Ser Asn Ile Phe Ser Asp Lys Lys Asp Gly
                700                 705                 710

ggg cag tat atg cga tgc aaa aca ggt atg cag tcg att tgc cat gcc        2256
Gly Gln Tyr Met Arg Cys Lys Thr Gly Met Gln Ser Ile Cys His Ala
                715                 720                 725

atg tca aag gaa ctt gtt cca ggc tca gtg cac ctc aac acc ccc gtc        2304
Met Ser Lys Glu Leu Val Pro Gly Ser Val His Leu Asn Thr Pro Val
    730                 735                 740

gct gaa att gag cag tcg gca tcc ggc tgt aca gta cga tcg gcc tcg        2352
Ala Glu Ile Glu Gln Ser Ala Ser Gly Cys Thr Val Arg Ser Ala Ser
745                 750                 755                 760

ggc gcc gtg ttc cga agc aaa aag gtg gtg gtt tcg tta ccg aca acc        2400
Gly Ala Val Phe Arg Ser Lys Lys Val Val Val Ser Leu Pro Thr Thr
                765                 770                 775

ttg tat ccc acc ttg aca ttt tca cca cct ctt ccc gcc gag aag caa        2448
Leu Tyr Pro Thr Leu Thr Phe Ser Pro Pro Leu Pro Ala Glu Lys Gln
                780                 785                 790

gca ttg gcg gaa aat tct atc ctg ggc tac tat agc aag ata gtc ttc        2496
Ala Leu Ala Glu Asn Ser Ile Leu Gly Tyr Tyr Ser Lys Ile Val Phe
                795                 800                 805

gta tgg gac aag ccg tgg tgg cgc gaa caa ggc ttc tcg ggc gtc ctc        2544
Val Trp Asp Lys Pro Trp Trp Arg Glu Gln Gly Phe Ser Gly Val Leu
    810                 815                 820

caa tcg agc tgt gac ccc atc tca ttt gcc aga gat acc agc atc gac        2592
Gln Ser Ser Cys Asp Pro Ile Ser Phe Ala Arg Asp Thr Ser Ile Asp
825                 830                 835                 840

gtc gat cga caa tgg tcc att acc tgt ttc atg gtc gga gac ccg gga        2640
Val Asp Arg Gln Trp Ser Ile Thr Cys Phe Met Val Gly Asp Pro Gly
                845                 850                 855

cgg aag tgg tcc caa cag tcc aag cag gta cga caa aag tct gtc tgg        2688
Arg Lys Trp Ser Gln Gln Ser Lys Gln Val Arg Gln Lys Ser Val Trp
                860                 865                 870

gac caa ctc cgc gca gcc tac gag aac gcc ggg gcc caa gtc cca gag        2736
Asp Gln Leu Arg Ala Ala Tyr Glu Asn Ala Gly Ala Gln Val Pro Glu
                875                 880                 885
```

43

```
ccg gcc aac gtg ctc gaa atc gag tgg tcg aag cag cag tat ttc caa        2784
Pro Ala Asn Val Leu Glu Ile Glu Trp Ser Lys Gln Gln Tyr Phe Gln
    890                     895                 900

gga gct ccg agc gcc gtc tat ggg ctg aac gat ctc atc aca ctg ggt        2832
Gly Ala Pro Ser Ala Val Tyr Gly Leu Asn Asp Leu Ile Thr Leu Gly
905                     910                 915                 920

tcg gcg ctc aga acg ccg ttc aag agt gtt cat ttc gtt gga acg gag        2880
Ser Ala Leu Arg Thr Pro Phe Lys Ser Val His Phe Val Gly Thr Glu
                925                 930                 935

acg tct tta gtt tgg aaa ggg tat atg gaa ggg gcc ata cga tcg ggt        2928
Thr Ser Leu Val Trp Lys Gly Tyr Met Glu Gly Ala Ile Arg Ser Gly
                940                 945                 950

caa cga ggt gct gca gaa gtt gtg gct agc ctg gtg cca gca gca          2973
Gln Arg Gly Ala Ala Glu Val Val Ala Ser Leu Val Pro Ala Ala
            955                 960                 965

tag                                                                      2976
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        <211> 991
        <212> PRT
        <213> Unknown

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        <221> SIGNAL
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                -20                 -15                 -10
Leu Ser Ala Ser Leu Ala Ser Gly Thr Asp Phe Pro Val Arg Arg Thr
                -5                  1                   5
Asp Leu Gly Gln Val Gln Gly Leu Ala Gly Asp Val Met Ser Phe Arg
    10                  15                  20
Gly Ile Pro Tyr Ala Ala Pro Pro Val Gly Gly Leu Arg Trp Lys Pro
25                  30                  35                  40
Pro Gln His Ala Arg Pro Trp Ala Gly Val Arg Pro Ala Thr Gln Phe
                45                  50                  55
Gly Ser Asp Cys Phe Gly Ala Ala Tyr Leu Arg Lys Gly Ser Leu Ala
                60                  65                  70
Pro Gly Val Ser Glu Asp Cys Leu Tyr Leu Asn Val Trp Ala Pro Ser
                75                  80                  85
Gly Ala Lys Pro Gly Gln Tyr Pro Val Met Val Trp Val Tyr Gly Gly
                90                  95                  100
Gly Phe Ala Gly Gly Thr Ala Ala Met Pro Tyr Tyr Asp Gly Glu Ala
105                 110                 115                 120
Leu Ala Arg Gln Gly Val Val Val Val Thr Phe Asn Tyr Arg Thr Asn
                125                 130                 135
Ile Leu Gly Phe Phe Ala His Pro Gly Leu Ser Arg Glu Ser Pro Thr
                140                 145                 150
Gly Thr Ser Gly Asn Tyr Gly Leu Leu Asp Ile Leu Ala Ala Leu Arg
                155                 160                 165
Trp Val Gln Ser Asn Ala Arg Ala Phe Gly Gly Asp Pro Gly Arg Val
```
                                     44

```
          170                    175                    180
Thr Val Phe Gly Glu Ser Ala Gly Ala Ser Ala Ile Gly Leu Leu Leu
185                    190                    195                    200
Thr Ser Pro Leu Ser Lys Gly Leu Phe Arg Gly Ala Ile Leu Glu Ser
                   205                    210                    215
Pro Gly Leu Thr Arg Pro Leu Ala Thr Leu Ala Asp Ser Ala Ala Ser
                   220                    225                    230
Gly Glu Arg Leu Asp Ala Asp Leu Ser Arg Leu Arg Ser Thr Asp Pro
             235                    240                    245
Ala Thr Leu Met Ala Arg Ala Asp Ala Ala Arg Pro Ala Ser Arg Asp
          250                    255                    260
Leu Arg Arg Pro Arg Pro Thr Gly Pro Ile Val Asp Gly His Val Leu
265                    270                    275                    280
Pro Gln Thr Asp Ser Ala Ala Ile Ala Ala Gly Gln Leu Ala Pro Val
                   285                    290                    295
Arg Val Leu Ile Gly Thr Asn Ala Asp Glu Gly Arg Ala Phe Leu Gly
                   300                    305                    310
Arg Ala Pro Met Glu Thr Pro Ala Asp Tyr Gln Ala Tyr Leu Glu Ala
             315                    320                    325
Gln Phe Gly Asp Gln Ala Ala Ala Val Ala Ala Cys Tyr Pro Leu Asp
          330                    335                    340
Gly Arg Ala Thr Pro Lys Glu Met Val Ala Arg Ile Phe Gly Asp Asn
345                    350                    355                    360
Gln Phe Asn Arg Gly Val Ser Ala Phe Ser Glu Ala Leu Val Arg Gln
                   365                    370                    375
Gly Ala Pro Val Trp Arg Tyr Gln Phe Asn Gly Asn Thr Glu Gly Gly
             380                    385                    390
Arg Ala Pro Ala Thr His Gly Ala Glu Ile Pro Tyr Val Phe Gly Val
             395                    400                    405
Phe Lys Leu Asp Glu Leu Gly Leu Phe Asp Trp Pro Pro Glu Gly Pro
       410                    415                    420
Thr Pro Ala Asp Arg Ala Leu Gly Gln Leu Met Ser Ser Ala Trp Val
425                    430                    435                    440
Arg Phe Ala Lys Asn Gly Asp Pro Ala Gly Asp Ala Leu Thr Trp Pro
                   445                    450                    455
Ala Tyr Ser Thr Gly Lys Ser Thr Met Thr Phe Gly Pro Glu Gly Arg
             460                    465                    470
Ala Ala Val Val Ser Pro Gly Pro Ser Ile Pro Pro Cys Ala Asp Gly
             475                    480                    485
Ala Lys Ala Gly Gly Gly Gly Ser Gly Gly Gly Ser Gly Gly Gly Ser
          490                    495                    500
Lys Asp Asn Val Ala Asp Val Val Val Val Gly Ala Gly Leu Ser Gly
505                    510                    515                    520
Leu Glu Thr Ala Arg Lys Val Gln Ala Ala Gly Leu Ser Cys Leu Val
                   525                    530                    535
Leu Glu Ala Met Asp Arg Val Gly Gly Lys Thr Leu Ser Val Gln Ser
             540                    545                    550
Gly Pro Gly Arg Thr Thr Ile Asn Asp Leu Gly Ala Ala Trp Ile Asn
             555                    560                    565
Asp Ser Asn Gln Ser Glu Val Ser Arg Leu Phe Glu Arg Phe His Leu
          570                    575                    580
Glu Gly Glu Leu Gln Arg Thr Thr Gly Asn Ser Ile His Gln Ala Gln
585                    590                    595                    600
Asp Gly Thr Thr Thr Thr Ala Pro Tyr Gly Asp Ser Leu Leu Ser Glu
                   605                    610                    615
Glu Val Ala Ser Ala Leu Ala Glu Leu Leu Pro Val Trp Ser Gln Leu
             620                    625                    630
Ile Glu Glu His Ser Leu Gln Asp Leu Lys Ala Ser Pro Gln Ala Lys
                              45
```

```
             635                    640                       645
Arg Leu Asp Ser Val Ser Phe Ala His Tyr Cys Glu Lys Glu Leu Asn
    650                    655                660
Leu Pro Ala Val Leu Gly Val Ala Asn Gln Ile Thr Arg Ala Leu Leu
665                    670                675                    680
Gly Val Glu Ala His Glu Ile Ser Met Leu Phe Leu Thr Asp Tyr Ile
                685                    690                    695
Lys Ser Ala Thr Gly Leu Ser Asn Ile Phe Ser Asp Lys Lys Asp Gly
                700                    705                710
Gly Gln Tyr Met Arg Cys Lys Thr Gly Met Gln Ser Ile Cys His Ala
                715                    720                725
Met Ser Lys Glu Leu Val Pro Gly Ser Val His Leu Asn Thr Pro Val
                730                    735                740
Ala Glu Ile Glu Gln Ser Ala Ser Gly Cys Thr Val Arg Ser Ala Ser
745                    750                755                    760
Gly Ala Val Phe Arg Ser Lys Lys Val Val Ser Leu Pro Thr Thr
                765                    770                    775
Leu Tyr Pro Thr Leu Thr Phe Ser Pro Pro Leu Pro Ala Glu Lys Gln
                780                    785                790
Ala Leu Ala Glu Asn Ser Ile Leu Gly Tyr Tyr Ser Lys Ile Val Phe
                795                    800                805
Val Trp Asp Lys Pro Trp Trp Arg Glu Gln Gly Phe Ser Gly Val Leu
    810                    815                820
Gln Ser Ser Cys Asp Pro Ile Ser Phe Ala Arg Asp Thr Ser Ile Asp
825                    830                835                    840
Val Asp Arg Gln Trp Ser Ile Thr Cys Phe Met Val Gly Asp Pro Gly
                845                    850                    855
Arg Lys Trp Ser Gln Gln Ser Lys Gln Val Arg Gln Lys Ser Val Trp
                860                    865                870
Asp Gln Leu Arg Ala Ala Tyr Glu Asn Ala Gly Ala Gln Val Pro Glu
                875                    880                    885
Pro Ala Asn Val Leu Glu Ile Glu Trp Ser Lys Gln Gln Tyr Phe Gln
    890                    895                900
Gly Ala Pro Ser Ala Val Tyr Gly Leu Asn Asp Leu Ile Thr Leu Gly
905                    910                915                    920
Ser Ala Leu Arg Thr Pro Phe Lys Ser Val His Phe Val Gly Thr Glu
                925                    930                935
Thr Ser Leu Val Trp Lys Gly Tyr Met Glu Gly Ala Ile Arg Ser Gly
                940                    945                950
Gln Arg Gly Ala Ala Glu Val Val Ala Ser Leu Val Pro Ala Ala
                955                    960                965
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<210> 28
<211> 3618
<212> DNA
<213> Unknown

<220>
<223> gst:esp1:sp:K:trapao, 3618. 1-687, gst +
      polylinker; 688-2190, esp1 mat; 2191-2226 spacer;
      2227-3615, K:trAPAO, 3616-3618, stop codon. For
      bacterial expression.

<221> CDS
<222> (1)...(3615)

<221> misc_feature

46

<222> (1)...(687)
<223> gst + polylinker

<221> mat_peptide
<222> (688)...(2190)
<223> esp1 mat

<221> misc_feature
<222> (2191)...(2226)
<223> spacer sequence

<221> misc_feature
<222> (2227)...(3615)
<223> K:trAPAO

<221> misc_feature
<222> (2227)...(2229)
<223> Extra lysine

<400> 28

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atg tcc cct ata cta ggt tat tgg aaa att aag ggc ctt gtg caa ccc       48
Met Ser Pro Ile Leu Gly Tyr Trp Lys Ile Lys Gly Leu Val Gln Pro
1               5                   10                  15


act cga ctt ctt ttg gaa tat ctt gaa gaa aaa tat gaa gag cat ttg       96
Thr Arg Leu Leu Leu Glu Tyr Leu Glu Glu Lys Tyr Glu Glu His Leu
                20                  25                  30


tat gag cgc gat gaa ggt gat aaa tgg cga aac aaa aag ttt gaa ttg      144
Tyr Glu Arg Asp Glu Gly Asp Lys Trp Arg Asn Lys Lys Phe Glu Leu
        35                  40                  45


ggt ttg gag ttt ccc aat ctt cct tat tat att gat ggt gat gtt aaa      192
Gly Leu Glu Phe Pro Asn Leu Pro Tyr Tyr Ile Asp Gly Asp Val Lys
    50                  55                  60


tta aca cag tct atg gcc atc ata cgt tat ata gct gac aag cac aac      240
Leu Thr Gln Ser Met Ala Ile Ile Arg Tyr Ile Ala Asp Lys His Asn
65                  70                  75                  80


atg ttg ggt ggt tgt cca aaa gag cgt gca gag att tca atg ctt gaa      288
Met Leu Gly Gly Cys Pro Lys Glu Arg Ala Glu Ile Ser Met Leu Glu
                85                  90                  95


gga gcg gtt ttg gat att aga tac ggt gtt tcg aga att gca tat agt      336
Gly Ala Val Leu Asp Ile Arg Tyr Gly Val Ser Arg Ile Ala Tyr Ser
            100                 105                 110


aaa gac ttt gaa act ctc aaa gtt gat ttt ctt agc aag cta cct gaa      384
Lys Asp Phe Glu Thr Leu Lys Val Asp Phe Leu Ser Lys Leu Pro Glu
            115                 120                 125


atg ctg aaa atg ttc gaa gat cgt tta tgt cat aaa aca tat tta aat      432
Met Leu Lys Met Phe Glu Asp Arg Leu Cys His Lys Thr Tyr Leu Asn
130                 135                 140


ggt gat cat gta acc cat cct gac ttc atg ttg tat gac gct ctt gat      480
Gly Asp His Val Thr His Pro Asp Phe Met Leu Tyr Asp Ala Leu Asp
```

47

gtt gtt tta tac atg gac cca atg tgc ctg gat gcg ttc cca aaa tta   528
Val Val Leu Tyr Met Asp Pro Met Cys Leu Asp Ala Phe Pro Lys Leu
                165   170   175

gtt tgt ttt aaa aaa cgt att gaa gct atc cca caa att gat aag tac   576
Val Cys Phe Lys Lys Arg Ile Glu Ala Ile Pro Gln Ile Asp Lys Tyr
                180   185   190

ttg aaa tcc agc aag tat ata gca tgg cct ttg cag ggc tgg caa gcc   624
Leu Lys Ser Ser Lys Tyr Ile Ala Trp Pro Leu Gln Gly Trp Gln Ala
                195   200   205

acg ttt ggt ggt ggc gac cat cct cca aaa tcg gat ctg gtt ccg cgt   672
Thr Phe Gly Gly Gly Asp His Pro Pro Lys Ser Asp Leu Val Pro Arg
    210   215   220

gga tcc ccg gaa ttc gct cct act gtc aag att gat gct ggg atg gtg   720
Gly Ser Pro Glu Phe Ala Pro Thr Val Lys Ile Asp Ala Gly Met Val
225   230   235   240

gtc ggc acg act act act gtc ccc ggc acc act gcg acc gtc agc gag   768
Val Gly Thr Thr Thr Thr Val Pro Gly Thr Thr Ala Thr Val Ser Glu
                245   250   255

ttc ttg ggc gtt cct ttt gcc gcc tct ccg aca cga ttt gcg cct cct   816
Phe Leu Gly Val Pro Phe Ala Ala Ser Pro Thr Arg Phe Ala Pro Pro
                260   265   270

act cgt ccc gtg cct tgg tca acg cct ttg caa gcc act gca tat ggt   864
Thr Arg Pro Val Pro Trp Ser Thr Pro Leu Gln Ala Thr Ala Tyr Gly
                275   280   285

cca gca tgc cct caa caa ttc aat tac ccc gaa gaa ctc cgt gag att   912
Pro Ala Cys Pro Gln Gln Phe Asn Tyr Pro Glu Glu Leu Arg Glu Ile
    290   295   300

acg atg gcc tgg ttc aat aca ccg ccc ccg tca gct ggt gaa agt gag   960
Thr Met Ala Trp Phe Asn Thr Pro Pro Pro Ser Ala Gly Glu Ser Glu
305   310   315   320

gac tgc ctg aac ctc aac atc tac gtc cca gga act gag aac aca aac   1008
Asp Cys Leu Asn Leu Asn Ile Tyr Val Pro Gly Thr Glu Asn Thr Asn
                325   330   335

aaa gcc gtc atg gtt tgg ata tac ggt gga gcg ctg gaa tat ggt tgg   1056
Lys Ala Val Met Val Trp Ile Tyr Gly Gly Ala Leu Glu Tyr Gly Trp
                340   345   350

aat tca ttc cac ctt tac gac ggg gct agt ttc gca gcc aat cag gat   1104
Asn Ser Phe His Leu Tyr Asp Gly Ala Ser Phe Ala Ala Asn Gln Asp
                355   360   365

gtc atc gcc gtg acc atc aac tac aga acg aac att ctg ggg ttc cct   1152
Val Ile Ala Val Thr Ile Asn Tyr Arg Thr Asn Ile Leu Gly Phe Pro
    370   375   380

```
gct gcc cct cag ctt cca ata aca cag cga aat ctg ggg ttc cta gac        1200
Ala Ala Pro Gln Leu Pro Ile Thr Gln Arg Asn Leu Gly Phe Leu Asp
385                 390                 395                 400

caa agg ttt gct ttg gat tgg gta cag cgg aac atc gca gcc ttt ggc        1248
Gln Arg Phe Ala Leu Asp Trp Val Gln Arg Asn Ile Ala Ala Phe Gly
                    405                 410                 415

ggt gat cct cga aag gtc aca ata ttt ggg cag agt gcg ggg ggc aga        1296
Gly Asp Pro Arg Lys Val Thr Ile Phe Gly Gln Ser Ala Gly Gly Arg
                420                 425                 430

agt gtc gac gtc ctc ttg acg tct atg cca cac aac cca ccc ttc cga        1344
Ser Val Asp Val Leu Leu Thr Ser Met Pro His Asn Pro Pro Phe Arg
                435                 440                 445

gca gca atc atg gag tcc ggt gtg gct aac tac aac ttc ccc aag gga        1392
Ala Ala Ile Met Glu Ser Gly Val Ala Asn Tyr Asn Phe Pro Lys Gly
            450                 455                 460

gat ttg tcc gaa cct tgg aac acc act gtt caa gct ctc aac tgt acc        1440
Asp Leu Ser Glu Pro Trp Asn Thr Thr Val Gln Ala Leu Asn Cys Thr
465                 470                 475                 480

acc agt atc gac atc ttg agt tgt atg aga aga gtc gat ctc gcc act        1488
Thr Ser Ile Asp Ile Leu Ser Cys Met Arg Arg Val Asp Leu Ala Thr
                    485                 490                 495

ctg atg aac acg atc gag caa ctc gga ctt ggg ttt gag tac acg ttg        1536
Leu Met Asn Thr Ile Glu Gln Leu Gly Leu Gly Phe Glu Tyr Thr Leu
                500                 505                 510

gac aac gta acg gct gtg tac cgt tct gaa acg gct cgc acg act ggt        1584
Asp Asn Val Thr Ala Val Tyr Arg Ser Glu Thr Ala Arg Thr Thr Gly
                515                 520                 525

gac att gct cgt gta cct gtt ctc gtc ggg acg gtg gcc aac gac gga        1632
Asp Ile Ala Arg Val Pro Val Leu Val Gly Thr Val Ala Asn Asp Gly
            530                 535                 540

ctt ctc ttt gtc ctc ggg gag aat gac acc caa gca tat ctc gag gag        1680
Leu Leu Phe Val Leu Gly Glu Asn Asp Thr Gln Ala Tyr Leu Glu Glu
545                 550                 555                 560

gca atc ccg aat cag ccc gac ctt tac cag act ctc ctt gga gca tat        1728
Ala Ile Pro Asn Gln Pro Asp Leu Tyr Gln Thr Leu Leu Gly Ala Tyr
                565                 570                 575

ccc att gga tcc cca ggg atc gga tcg cct caa gat cag att gcc gcc        1776
Pro Ile Gly Ser Pro Gly Ile Gly Ser Pro Gln Asp Gln Ile Ala Ala
                580                 585                 590

att gag acc gag gta aga ttc cag tgt cct tct gcc atc gtg gct cag        1824
Ile Glu Thr Glu Val Arg Phe Gln Cys Pro Ser Ala Ile Val Ala Gln
            595                 600                 605

gac tcc cgg aat cgg ggt atc cct tct tgg cgc tac tac tac aat gcg        1872
Asp Ser Arg Asn Arg Gly Ile Pro Ser Trp Arg Tyr Tyr Tyr Asn Ala
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49

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         610                      615                      620

acc ttt gag aat ctg gag ctt ttc cct ggg tcc gaa gtg tac cac agc        1920
Thr Phe Glu Asn Leu Glu Leu Phe Pro Gly Ser Glu Val Tyr His Ser
625                      630                      635                      640

tct gaa gtc ggg atg gtg ttt ggc acg tat cct gtc gca agt gcg acc        1968
Ser Glu Val Gly Met Val Phe Gly Thr Tyr Pro Val Ala Ser Ala Thr
                         645                      650                      655

gcc ttg gag gcc cag acg agc aaa tac atg cag ggt gcc tgg gcg gcc        2016
Ala Leu Glu Ala Gln Thr Ser Lys Tyr Met Gln Gly Ala Trp Ala Ala
                         660                      665           .          670

ttt gcc aaa aac ccc atg aat ggg cct ggg tgg aaa caa gtg ccg aat        2064
Phe Ala Lys Asn Pro Met Asn Gly Pro Gly Trp Lys Gln Val Pro Asn
                    675                      680                      685

gtc gcg gcg ctt ggc tca cca ggc aaa gcc atc cag gtt gac gtc tct        2112
Val Ala Ala Leu Gly Ser Pro Gly Lys Ala Ile Gln Val Asp Val Ser
               690                      695                      700

cca gcg aca ata gac caa cga tgt gcc ttg tac acg cgt tat tat act        2160
Pro Ala Thr Ile Asp Gln Arg Cys Ala Leu Tyr Thr Arg Tyr Tyr Thr
705                      710                      715                      720

gag ttg ggc aca atc gcg ccg agg aca ttt ggc gga ggc agc ggc gga        2208
Glu Leu Gly Thr Ile Ala Pro Arg Thr Phe Gly Gly Gly Ser Gly Gly
                         725                      730                      735

ggc agc ggc gga ggc agc aaa gac aac gtt gcg gac gtg gta gtg gtg        2256
Gly Ser Gly Gly Gly Ser Lys Asp Asn Val Ala Asp Val Val Val Val
                    740                      745                      750

ggc gct ggc ttg agc ggt ttg gag acg gca cgc aaa gtc cag gcc gcc        2304
Gly Ala Gly Leu Ser Gly Leu Glu Thr Ala Arg Lys Val Gln Ala Ala
               755                      760                      765

ggt ctg tcc tgc ctc gtt ctt gag gcg atg gat cgt gta ggg gga aag        2352
Gly Leu Ser Cys Leu Val Leu Glu Ala Met Asp Arg Val Gly Gly Lys
          770                      775                      780

act ctg agc gta caa tcg ggt ccc ggc agg acg act atc aac gac ctc        2400
Thr Leu Ser Val Gln Ser Gly Pro Gly Arg Thr Thr Ile Asn Asp Leu
785                      790                      795                      800

ggc gct gcg tgg atc aat gac agc aac caa agc gaa gta tcc aga ttg        2448
Gly Ala Ala Trp Ile Asn Asp Ser Asn Gln Ser Glu Val Ser Arg Leu
                         805                      810                      815

ttt gaa aga ttt cat ttg gag ggc gag ctc cag agg acg act gga aat        2496
Phe Glu Arg Phe His Leu Glu Gly Glu Leu Gln Arg Thr Thr Gly Asn
                    820                      825                      830

tca atc cat caa gca caa gac ggt aca acc act aca gct cct tat ggt        2544
Ser Ile His Gln Ala Gln Asp Gly Thr Thr Thr Thr Ala Pro Tyr Gly
               835                      840                      845
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50

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gac tcc ttg ctg agc gag gag gtt gca agt gca ctt gcg gaa ctc ctc          2592
Asp Ser Leu Leu Ser Glu Glu Val Ala Ser Ala Leu Ala Glu Leu Leu
    850                 855                 860

ccc gta tgg tct cag ctg atc gaa gag cat agc ctt caa gac ctc aag          2640
Pro Val Trp Ser Gln Leu Ile Glu Glu His Ser Leu Gln Asp Leu Lys
865                 870                 875                 880

gcg agc cct cag gcg aag cgg ctc gac agt gtg agc ttc gcg cac tac          2688
Ala Ser Pro Gln Ala Lys Arg Leu Asp Ser Val Ser Phe Ala His Tyr
            885                 890                 895

tgt gag aag gaa cta aac ttg cct gct gtt ctc ggc gta gca aac cag          2736
Cys Glu Lys Glu Leu Asn Leu Pro Ala Val Leu Gly Val Ala Asn Gln
            900                 905                 910

atc aca cgc gct ctg ctc ggt gtg gaa gcc cac gag atc agc atg ctt          2784
Ile Thr Arg Ala Leu Leu Gly Val Glu Ala His Glu Ile Ser Met Leu
            915                 920                 925

ttt ctc acc gac tac atc aag agt gcc acc ggt ctc agt aat att ttc          2832
Phe Leu Thr Asp Tyr Ile Lys Ser Ala Thr Gly Leu Ser Asn Ile Phe
    930                 935                 940

tcg gac aag aaa gac ggc ggg cag tat atg cga tgc aaa aca ggt atg          2880
Ser Asp Lys Lys Asp Gly Gly Gln Tyr Met Arg Cys Lys Thr Gly Met
945                 950                 955                 960

cag tcg att tgc cat gcc atg tca aag gaa ctt gtt cca ggc tca gtg          2928
Gln Ser Ile Cys His Ala Met Ser Lys Glu Leu Val Pro Gly Ser Val
                965                 970                 975

cac ctc aac acc ccc gtc gct gaa att gag cag tcg gca tcc ggc tgt          2976
His Leu Asn Thr Pro Val Ala Glu Ile Glu Gln Ser Ala Ser Gly Cys
                980                 985                 990

aca gta cga tcg gcc tcg ggc gcc gtg ttc cga agc aaa aag gtg gtg          3024
Thr Val Arg Ser Ala Ser Gly Ala Val Phe Arg Ser Lys Lys Val Val
            995                 1000                1005

gtt tcg tta ccg aca acc ttg tat ccc acc ttg aca ttt tca cca cct          3072
Val Ser Leu Pro Thr Thr Leu Tyr Pro Thr Leu Thr Phe Ser Pro Pro
    1010                1015                1020

ctt ccc gcc gag aag caa gca ttg gcg gaa aat tct atc ctg ggc tac          3120
Leu Pro Ala Glu Lys Gln Ala Leu Ala Glu Asn Ser Ile Leu Gly Tyr
1025                1030                1035                1040

tat agc aag ata gtc ttc gta tgg gac aag ccg tgg tgg cgc gaa caa          3168
Tyr Ser Lys Ile Val Phe Val Trp Asp Lys Pro Trp Trp Arg Glu Gln
                1045                1050                1055

ggc ttc tcg ggc gtc ctc caa tcg agc tgt gac ccc atc tca ttt gcc          3216
Gly Phe Ser Gly Val Leu Gln Ser Ser Cys Asp Pro Ile Ser Phe Ala
                1060                1065                1070

aga gat acc agc atc gac gtc gat cga caa tgg tcc att acc tgt ttc          3264
Arg Asp Thr Ser Ile Asp Val Asp Arg Gln Trp Ser Ile Thr Cys Phe
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51

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atg gtc gga gac ccg gga cgg aag tgg tcc caa cag tcc aag cag gta      3312
Met Val Gly Asp Pro Gly Arg Lys Trp Ser Gln Gln Ser Lys Gln Val
    1090                1095                1100


cga caa aag tct gtc tgg gac caa ctc cgc gca gcc tac gag aac gcc      3360
Arg Gln Lys Ser Val Trp Asp Gln Leu Arg Ala Ala Tyr Glu Asn Ala
1105                1110                1115                1120


ggg gcc caa gtc cca gag ccg gcc aac gtg ctc gaa atc gag tgg tcg      3408
Gly Ala Gln Val Pro Glu Pro Ala Asn Val Leu Glu Ile Glu Trp Ser
                1125                1130                1135


aag cag cag tat ttc caa gga gct ccg agc gcc gtc tat ggg ctg aac      3456
Lys Gln Gln Tyr Phe Gln Gly Ala Pro Ser Ala Val Tyr Gly Leu Asn
                1140                1145                1150


gat ctc atc aca ctg ggt tcg gcg ctc aga acg ccg ttc aag agt gtt      3504
Asp Leu Ile Thr Leu Gly Ser Ala Leu Arg Thr Pro Phe Lys Ser Val
                1155                1160                1165


cat ttc gtt gga acg gag acg tct tta gtt tgg aaa ggg tat atg gaa      3552
His Phe Val Gly Thr Glu Thr Ser Leu Val Trp Lys Gly Tyr Met Glu
    1170                1175                1180


ggg gcc ata cga tcg ggt caa cga ggt gct gca gaa gtt gtg gct agc      3600
Gly Ala Ile Arg Ser Gly Gln Arg Gly Ala Ala Glu Val Val Ala Ser
1185                1190                1195                1200


ctg gtg cca gca gca tag                                              3618
Leu Val Pro Ala Ala
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 1               5                   10                  15
Thr Arg Leu Leu Leu Glu Tyr Leu Glu Glu Lys Tyr Glu Glu His Leu
            20                  25                  30
Tyr Glu Arg Asp Glu Gly Asp Lys Trp Arg Asn Lys Lys Phe Glu Leu
         35                  40                  45
Gly Leu Glu Phe Pro Asn Leu Pro Tyr Tyr Ile Asp Gly Asp Val Lys
      50                  55                  60
Leu Thr Gln Ser Met Ala Ile Ile Arg Tyr Ile Ala Asp Lys His Asn
65                  70                  75                  80
Met Leu Gly Gly Cys Pro Lys Glu Arg Ala Glu Ile Ser Met Leu Glu
               85                  90                  95
Gly Ala Val Leu Asp Ile Arg Tyr Gly Val Ser Arg Ile Ala Tyr Ser
            100                 105                 110
Lys Asp Phe Glu Thr Leu Lys Val Asp Phe Leu Ser Lys Leu Pro Glu
            115                 120                 125
Met Leu Lys Met Phe Glu Asp Arg Leu Cys His Lys Thr Tyr Leu Asn
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            130                 135                 140
Gly Asp His Val Thr His Pro Asp Phe Met Leu Tyr Asp Ala Leu Asp
145                 150                 155                 160
Val Val Leu Tyr Met Asp Pro Met Cys Leu Asp Ala Phe Pro Lys Leu
                165                 170                 175
Val Cys Phe Lys Lys Arg Ile Glu Ala Ile Pro Gln Ile Asp Lys Tyr
                180                 185                 190
Leu Lys Ser Ser Lys Tyr Ile Ala Trp Pro Leu Gln Gly Trp Gln Ala
                195                 200                 205
Thr Phe Gly Gly Gly Asp His Pro Pro Lys Ser Asp Leu Val Pro Arg
                210                 215                 220
Gly Ser Pro Glu Phe Ala Pro Thr Val Lys Ile Asp Ala Gly Met Val
225                 230                 235                 240
Val Gly Thr Thr Thr Thr Val Pro Gly Thr Thr Ala Thr Val Ser Glu
                245                 250                 255
Phe Leu Gly Val Pro Phe Ala Ala Ser Pro Thr Arg Phe Ala Pro Pro
                260                 265                 270
Thr Arg Pro Val Pro Trp Ser Thr Pro Leu Gln Ala Thr Ala Tyr Gly
                275                 280                 285
Pro Ala Cys Pro Gln Gln Phe Asn Tyr Pro Glu Glu Leu Arg Glu Ile
                290                 295                 300
Thr Met Ala Trp Phe Asn Thr Pro Pro Ser Ala Gly Glu Ser Glu
305                 310                 315                 320
Asp Cys Leu Asn Leu Asn Ile Tyr Val Pro Gly Thr Glu Asn Thr Asn
                325                 330                 335
Lys Ala Val Met Val Trp Ile Tyr Gly Gly Ala Leu Glu Tyr Gly Trp
                340                 345                 350
Asn Ser Phe His Leu Tyr Asp Gly Ala Ser Phe Ala Ala Asn Gln Asp
                355                 360                 365
Val Ile Ala Val Thr Ile Asn Tyr Arg Thr Asn Ile Leu Gly Phe Pro
                370                 375                 380
Ala Ala Pro Gln Leu Pro Ile Thr Gln Arg Asn Leu Gly Phe Leu Asp
385                 390                 395                 400
Gln Arg Phe Ala Leu Asp Trp Val Gln Arg Asn Ile Ala Ala Phe Gly
                405                 410                 415
Gly Asp Pro Arg Lys Val Thr Ile Phe Gly Gln Ser Ala Gly Gly Arg
                420                 425                 430
Ser Val Asp Val Leu Leu Thr Ser Met Pro His Asn Pro Pro Phe Arg
                435                 440                 445
Ala Ala Ile Met Glu Ser Gly Val Ala Asn Tyr Asn Phe Pro Lys Gly
                450                 455                 460
Asp Leu Ser Glu Pro Trp Asn Thr Thr Val Gln Ala Leu Asn Cys Thr
465                 470                 475                 480
Thr Ser Ile Asp Ile Leu Ser Cys Met Arg Arg Val Asp Leu Ala Thr
                485                 490                 495
Leu Met Asn Thr Ile Glu Gln Leu Gly Leu Gly Phe Glu Tyr Thr Leu
                500                 505                 510
Asp Asn Val Thr Ala Val Tyr Arg Ser Glu Thr Ala Arg Thr Thr Gly
                515                 520                 525
Asp Ile Ala Arg Val Pro Val Leu Val Gly Thr Val Ala Asn Asp Gly
                530                 535                 540
Leu Leu Phe Val Leu Gly Glu Asn Asp Thr Gln Ala Tyr Leu Glu Glu
545                 550                 555                 560
Ala Ile Pro Asn Gln Pro Asp Leu Tyr Gln Thr Leu Leu Gly Ala Tyr
                565                 570                 575
Pro Ile Gly Ser Pro Gly Ile Gly Ser Pro Gln Asp Gln Ile Ala Ala
                580                 585                 590
Ile Glu Thr Glu Val Arg Phe Gln Cys Pro Ser Ala Ile Val Ala Gln
                           53
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            595                     600                     605
Asp Ser Arg Asn Arg Gly Ile Pro Ser Trp Arg Tyr Tyr Tyr Asn Ala
    610                     615                 620
Thr Phe Glu Asn Leu Glu Leu Phe Pro Gly Ser Glu Val Tyr His Ser
625                     630                 635                 640
Ser Glu Val Gly Met Val Phe Gly Thr Tyr Pro Val Ala Ser Ala Thr
                645                 650                 655
Ala Leu Glu Ala Gln Thr Ser Lys Tyr Met Gln Gly Ala Trp Ala Ala
            660                 665                 670
Phe Ala Lys Asn Pro Met Asn Gly Pro Gly Trp Lys Gln Val Pro Asn
        675                 680                 685
Val Ala Ala Leu Gly Ser Pro Gly Lys Ala Ile Gln Val Asp Val Ser
    690                 695                 700
Pro Ala Thr Ile Asp Gln Arg Cys Ala Leu Tyr Thr Arg Tyr Tyr Thr
705                 710                 715                 720
Glu Leu Gly Thr Ile Ala Pro Arg Thr Phe Gly Gly Gly Ser Gly Gly
                725                 730                 735
Gly Ser Gly Gly Gly Ser Lys Asp Asn Val Ala Asp Val Val Val Val
            740                 745                 750
Gly Ala Gly Leu Ser Gly Leu Glu Thr Ala Arg Lys Val Gln Ala Ala
        755                 760                 765
Gly Leu Ser Cys Leu Val Leu Glu Ala Met Asp Arg Val Gly Gly Lys
    770                 775                 780
Thr Leu Ser Val Gln Ser Gly Pro Gly Arg Thr Thr Ile Asn Asp Leu
785                 790                 795                 800
Gly Ala Ala Trp Ile Asn Asp Ser Asn Gln Ser Glu Val Ser Arg Leu
                805                 810                 815
Phe Glu Arg Phe His Leu Glu Gly Glu Leu Gln Arg Thr Thr Gly Asn
            820                 825                 830
Ser Ile His Gln Ala Gln Asp Gly Thr Thr Thr Thr Ala Pro Tyr Gly
        835                 840                 845
Asp Ser Leu Leu Ser Glu Glu Val Ala Ser Ala Leu Ala Glu Leu Leu
    850                 855                 860
Pro Val Trp Ser Gln Leu Ile Glu Glu His Ser Leu Gln Asp Leu Lys
865                 870                 875                 880
Ala Ser Pro Gln Ala Lys Arg Leu Asp Ser Val Ser Phe Ala His Tyr
                885                 890                 895
Cys Glu Lys Glu Leu Asn Leu Pro Ala Val Leu Gly Val Ala Asn Gln
            900                 905                 910
Ile Thr Arg Ala Leu Leu Gly Val Glu Ala His Glu Ile Ser Met Leu
        915                 920                 925
Phe Leu Thr Asp Tyr Ile Lys Ser Ala Thr Gly Leu Ser Asn Ile Phe
    930                 935                 940
Ser Asp Lys Lys Asp Gly Gly Gln Tyr Met Arg Cys Lys Thr Gly Met
945                 950                 955                 960
Gln Ser Ile Cys His Ala Met Ser Lys Glu Leu Val Pro Gly Ser Val
                965                 970                 975
His Leu Asn Thr Pro Val Ala Glu Ile Glu Gln Ser Ala Ser Gly Cys
            980                 985                 990
Thr Val Arg Ser Ala Ser Gly Ala Val Phe Arg Ser Lys Lys Val Val
        995                 1000                1005
Val Ser Leu Pro Thr Thr Leu Tyr Pro Thr Leu Thr Phe Ser Pro Pro
    1010                1015                1020
Leu Pro Ala Glu Lys Gln Ala Leu Ala Glu Asn Ser Ile Leu Gly Tyr
1025                1030                1035                1040
Tyr Ser Lys Ile Val Phe Val Trp Asp Lys Pro Trp Trp Arg Glu Gln
                1045                1050                1055
Gly Phe Ser Gly Val Leu Gln Ser Ser Cys Asp Pro Ile Ser Phe Ala
                                 54
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                    1060                 1065                 1070
Arg Asp Thr Ser Ile Asp Val Asp Arg Gln Trp Ser Ile Thr Cys Phe
         1075                 1080                 1085
Met Val Gly Asp Pro Gly Arg Lys Trp Ser Gln Gln Ser Lys Gln Val
     1090                 1095                 1100
Arg Gln Lys Ser Val Trp Asp Gln Leu Arg Ala Ala Tyr Glu Asn Ala
1105                 1110                 1115                 1120
Gly Ala Gln Val Pro Glu Pro Ala Asn Val Leu Glu Ile Glu Trp Ser
                 1125                 1130                 1135
Lys Gln Gln Tyr Phe Gln Gly Ala Pro Ser Ala Val Tyr Gly Leu Asn
         1140                 1145                 1150
Asp Leu Ile Thr Leu Gly Ser Ala Leu Arg Thr Pro Phe Lys Ser Val
         1155                 1160                 1165
His Phe Val Gly Thr Glu Thr Ser Leu Val Trp Lys Gly Tyr Met Glu
     1170                 1175                 1180
Gly Ala Ile Arg Ser Gly Gln Arg Gly Ala Ala Glu Val Val Ala Ser
1185                 1190                 1195                 1200
Leu Val Pro Ala Ala
                 1205


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               bacterial expression vector pGEX-4T-1 or similar
               vector. gst:BEST1:sp:K:trAPAO fusion, 3591 nt.
               1-687 gst
               + polylinker,  688-2163, BEST1 mature; 2164-2199,
               spacer, 2200-3588, K:trAPAO


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Met Ser Pro Ile Leu Gly Tyr Trp Lys Ile Lys Gly Leu Val Gln Pro
 1               5                  10                  15

act cga ctt ctt ttg gaa tat ctt gaa gaa aaa tat gaa gag cat ttg        96
Thr Arg Leu Leu Leu Glu Tyr Leu Glu Glu Lys Tyr Glu Glu His Leu
            20                  25                  30

tat gag cgc gat gaa ggt gat aaa tgg cga aac aaa aag ttt gaa ttg       144
Tyr Glu Arg Asp Glu Gly Asp Lys Trp Arg Asn Lys Lys Phe Glu Leu
            35                  40                  45

ggt ttg gag ttt ccc aat ctt cct tat tat att gat ggt gat gtt aaa       192
Gly Leu Glu Phe Pro Asn Leu Pro Tyr Tyr Ile Asp Gly Asp Val Lys
        50                  55                  60

tta aca cag tct atg gcc atc ata cgt tat ata gct gac aag cac aac       240
Leu Thr Gln Ser Met Ala Ile Ile Arg Tyr Ile Ala Asp Lys His Asn
65                  70                  75                  80

atg ttg ggt ggt tgt cca aaa gag cgt gca gag att tca atg ctt gaa       288
Met Leu Gly Gly Cys Pro Lys Glu Arg Ala Glu Ile Ser Met Leu Glu
                85                  90                  95

gga gcg gtt ttg gat att aga tac ggt gtt tcg aga att gca tat agt       336
Gly Ala Val Leu Asp Ile Arg Tyr Gly Val Ser Arg Ile Ala Tyr Ser
            100                 105                 110

aaa gac ttt gaa act ctc aaa gtt gat ttt ctt agc aag cta cct gaa       384
Lys Asp Phe Glu Thr Leu Lys Val Asp Phe Leu Ser Lys Leu Pro Glu
            115                 120                 125

atg ctg aaa atg ttc gaa gat cgt tta tgt cat aaa aca tat tta aat       432
Met Leu Lys Met Phe Glu Asp Arg Leu Cys His Lys Thr Tyr Leu Asn
        130                 135                 140

ggt gat cat gta acc cat cct gac ttc atg ttg tat gac gct ctt gat       480
Gly Asp His Val Thr His Pro Asp Phe Met Leu Tyr Asp Ala Leu Asp
145                 150                 155                 160

gtt gtt tta tac atg gac cca atg tgc ctg gat gcg ttc cca aaa tta       528
Val Val Leu Tyr Met Asp Pro Met Cys Leu Asp Ala Phe Pro Lys Leu
                165                 170                 175

gtt tgt ttt aaa aaa cgt att gaa gct atc cca caa att gat aag tac       576
Val Cys Phe Lys Lys Arg Ile Glu Ala Ile Pro Gln Ile Asp Lys Tyr
            180                 185                 190

ttg aaa tcc agc aag tat ata gca tgg cct ttg cag ggc tgg caa gcc       624
Leu Lys Ser Ser Lys Tyr Ile Ala Trp Pro Leu Gln Gly Trp Gln Ala
            195                 200                 205

acg ttt ggt ggt ggc gac cat cct cca aaa tcg gat ctg gtt ccg cgt       672
Thr Phe Gly Gly Gly Asp His Pro Pro Lys Ser Asp Leu Val Pro Arg
            210                 215                 220

gga tcc ccg gaa ttc acg gat ttt ccg gtc cgc agg acc gat ctg ggc       720
Gly Ser Pro Glu Phe Thr Asp Phe Pro Val Arg Arg Thr Asp Leu Gly
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56

cag gtt cag gga ctg gcc ggg gac gtg atg agc ttt cgc gga ata ccc   768
Gln Val Gln Gly Leu Ala Gly Asp Val Met Ser Phe Arg Gly Ile Pro
            245   250   255

tat gca gcg ccg ccg gtg ggc ggg ctg cgt tgg aag ccg ccc caa cac   816
Tyr Ala Ala Pro Pro Val Gly Gly Leu Arg Trp Lys Pro Pro Gln His
            260   265   270

gcc cgg ccc tgg gcg ggc gtt cgc ccc gcc acc caa ttt ggc tcc gac   864
Ala Arg Pro Trp Ala Gly Val Arg Pro Ala Thr Gln Phe Gly Ser Asp
            275   280   285

tgc ttc ggc gcg gcc tat ctt cgc aaa ggc agc ctc gcc ccc ggc gtg   912
Cys Phe Gly Ala Ala Tyr Leu Arg Lys Gly Ser Leu Ala Pro Gly Val
            290   295   300

agc gag gac tgt ctt tac ctc aac gta tgg gcg ccg tca ggc gct aaa   960
Ser Glu Asp Cys Leu Tyr Leu Asn Val Trp Ala Pro Ser Gly Ala Lys
305   310   315   320

ccc ggc cag tac ccc gtc atg gtc tgg gtc tac ggc ggc ggc ttc gcc   1008
Pro Gly Gln Tyr Pro Val Met Val Trp Val Tyr Gly Gly Gly Phe Ala
            325   330   335

ggc ggc acg gcc gcc atg ccc tac tac gac ggc gag gcg ctt gcg cga   1056
Gly Gly Thr Ala Ala Met Pro Tyr Tyr Asp Gly Glu Ala Leu Ala Arg
            340   345   350

cag ggc gtc gtc gtg gtg acg ttt aac tat cgg acg aac atc ctg ggc   1104
Gln Gly Val Val Val Val Thr Phe Asn Tyr Arg Thr Asn Ile Leu Gly
            355   360   365

ttt ttc gcc cat cct ggt ctc tcg cgc gag agc ccc acc gga act tcg   1152
Phe Phe Ala His Pro Gly Leu Ser Arg Glu Ser Pro Thr Gly Thr Ser
            370   375   380

ggc aac tac ggc cta ctc gac att ctc gcc gct ctt cgg tgg gtg cag   1200
Gly Asn Tyr Gly Leu Leu Asp Ile Leu Ala Ala Leu Arg Trp Val Gln
385   390   395   400

agc aac gcc cgc gcc ttc gga ggg gac ccc ggc cga gtg acg gtc ttt   1248
Ser Asn Ala Arg Ala Phe Gly Gly Asp Pro Gly Arg Val Thr Val Phe
            405   410   415

ggt gaa tcg gcc gga gcg agc gcg atc gga ctt ctg ctc acc tcg ccg   1296
Gly Glu Ser Ala Gly Ala Ser Ala Ile Gly Leu Leu Leu Thr Ser Pro
            420   425   430

ctg agc aag ggt ctc ttc cgt ggc gct atc ctc gaa agt cca ggg ctg   1344
Leu Ser Lys Gly Leu Phe Arg Gly Ala Ile Leu Glu Ser Pro Gly Leu
            435   440   445

acg cga ccg ctc gcg acg ctc gcc gac agc gcc gcc tcg ggc gag cgc   1392
Thr Arg Pro Leu Ala Thr Leu Ala Asp Ser Ala Ala Ser Gly Glu Arg
            450   455   460

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ctc gac gcc gat ctt tcg cga ctg cgc tcg acc gac cca gcc acc ctg     1440
Leu Asp Ala Asp Leu Ser Arg Leu Arg Ser Thr Asp Pro Ala Thr Leu
465             470             475             480

atg gcg cgc gcc gac gcg gcc cgc ccg gca tcg cgg gac ctg cgc agg     1488
Met Ala Arg Ala Asp Ala Ala Arg Pro Ala Ser Arg Asp Leu Arg Arg
                485             490             495

ccg cgt ccg acc gga ccg atc gtc gat ggc cat gtg ctg ccg cag acc     1536
Pro Arg Pro Thr Gly Pro Ile Val Asp Gly His Val Leu Pro Gln Thr
            500             505             510

gac agc gcg gcg atc gcg gcg ggg cag ctg gcg ccg gtt cgg gtc ctg     1584
Asp Ser Ala Ala Ile Ala Ala Gly Gln Leu Ala Pro Val Arg Val Leu
        515             520             525

atc gga acc aat gcc gac gaa ggc cgc gcc ttc ctc ggg cgc gcg ccg     1632
Ile Gly Thr Asn Ala Asp Glu Gly Arg Ala Phe Leu Gly Arg Ala Pro
        530             535             540

atg gag acg cca gcg gac tac caa gcc tat ctg gag gcg cag ttt ggc     1680
Met Glu Thr Pro Ala Asp Tyr Gln Ala Tyr Leu Glu Ala Gln Phe Gly
545             550             555             560

gac caa gcc gcc gcc gtg gcg gcg tgc tat ccc ctc gac ggc cgg gcc     1728
Asp Gln Ala Ala Ala Val Ala Ala Cys Tyr Pro Leu Asp Gly Arg Ala
            565             570             575

acg ccc aag gaa atg gtc gcg cgc atc ttc ggc gac aat cag ttc aat     1776
Thr Pro Lys Glu Met Val Ala Arg Ile Phe Gly Asp Asn Gln Phe Asn
            580             585             590

cgg ggg gtc tcg gcc ttc tcg gaa gcg ctt gtg cgc cag ggc gcg ccc     1824
Arg Gly Val Ser Ala Phe Ser Glu Ala Leu Val Arg Gln Gly Ala Pro
        595             600             605

gtg tgg cgt tat cag ttc aac ggt aat acc gag ggt gga aga gcg ccg     1872
Val Trp Arg Tyr Gln Phe Asn Gly Asn Thr Glu Gly Gly Arg Ala Pro
    610             615             620

gct acc cac gga gcc gaa att ccc tac gtt ttc ggg gtg ttc aag ctc     1920
Ala Thr His Gly Ala Glu Ile Pro Tyr Val Phe Gly Val Phe Lys Leu
625             630             635             640

gac gag ttg ggt ctg ttc gat tgg ccg ccc gag ggg ccc acg ccc gcc     1968
Asp Glu Leu Gly Leu Phe Asp Trp Pro Pro Glu Gly Pro Thr Pro Ala
            645             650             655

gac cgt gcg ctg ggc caa ctg atg tcc tcc gcc tgg gtc cgg ttc gcc     2016
Asp Arg Ala Leu Gly Gln Leu Met Ser Ser Ala Trp Val Arg Phe Ala
            660             665             670

aag aat ggc gac ccc gcc ggg gac gcc ctt acc tgg cct gcc tat tct     2064
Lys Asn Gly Asp Pro Ala Gly Asp Ala Leu Thr Trp Pro Ala Tyr Ser
            675             680             685

acg ggc aag tcg acc atg aca ttc ggt ccc gag ggc cgc gcg gcg gtg     2112
Thr Gly Lys Ser Thr Met Thr Phe Gly Pro Glu Gly Arg Ala Ala Val
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58

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gtg tcg ccc gga cct tcc atc ccc cct tgc gcg gat ggc gcc aag gcg     2160
Val Ser Pro Gly Pro Ser Ile Pro Pro Cys Ala Asp Gly Ala Lys Ala
705                     710                 715                 720

ggg ggc gga ggc agc ggc gga ggc agc ggc gga ggc agc aaa gac aac     2208
Gly Gly Gly Gly Ser Gly Gly Gly Ser Gly Gly Gly Ser Lys Asp Asn
                        725                 730                 735

gtt gcg gac gtg gta gtg gtg ggc gct ggc ttg agc ggt ttg gag acg     2256
Val Ala Asp Val Val Val Val Gly Ala Gly Leu Ser Gly Leu Glu Thr
                740                 745                 750

gca cgc aaa gtc cag gcc gcc ggt ctg tcc tgc ctc gtt ctt gag gcg     2304
Ala Arg Lys Val Gln Ala Ala Gly Leu Ser Cys Leu Val Leu Glu Ala
            755                 760                 765

atg gat cgt gta ggg gga aag act ctg agc gta caa tcg ggt ccc ggc     2352
Met Asp Arg Val Gly Gly Lys Thr Leu Ser Val Gln Ser Gly Pro Gly
        770                 775                 780

agg acg act atc aac gac ctc ggc gct gcg tgg atc aat gac agc aac     2400
Arg Thr Thr Ile Asn Asp Leu Gly Ala Ala Trp Ile Asn Asp Ser Asn
785                 790                 795                 800

caa agc gaa gta tcc aga ttg ttt gaa aga ttt cat ttg gag ggc gag     2448
Gln Ser Glu Val Ser Arg Leu Phe Glu Arg Phe His Leu Glu Gly Glu
                805                 810                 815

ctc cag agg acg act gga aat tca atc cat caa gca caa gac ggt aca     2496
Leu Gln Arg Thr Thr Gly Asn Ser Ile His Gln Ala Gln Asp Gly Thr
            820                 825                 830

acc act aca gct cct tat ggt gac tcc ttg ctg agc gag gag gtt gca     2544
Thr Thr Thr Ala Pro Tyr Gly Asp Ser Leu Leu Ser Glu Glu Val Ala
            835                 840                 845

agt gca ctt gcg gaa ctc ctc ccc gta tgg tct cag ctg atc gaa gag     2592
Ser Ala Leu Ala Glu Leu Leu Pro Val Trp Ser Gln Leu Ile Glu Glu
    850                 855                 860

cat agc ctt caa gac ctc aag gcg agc cct cag gcg aag cgg ctc gac     2640
His Ser Leu Gln Asp Leu Lys Ala Ser Pro Gln Ala Lys Arg Leu Asp
865                 870                 875                 880

agt gtg agc ttc gcg cac tac tgt gag aag gaa cta aac ttg cct gct     2688
Ser Val Ser Phe Ala His Tyr Cys Glu Lys Glu Leu Asn Leu Pro Ala
                885                 890                 895

gtt ctc ggc gta gca aac cag atc aca cgc gct ctg ctc ggt gtg gaa     2736
Val Leu Gly Val Ala Asn Gln Ile Thr Arg Ala Leu Leu Gly Val Glu
                900                 905                 910

gcc cac gag atc agc atg ctt ttt ctc acc gac tac atc aag agt gcc     2784
Ala His Glu Ile Ser Met Leu Phe Leu Thr Asp Tyr Ile Lys Ser Ala
            915                 920                 925
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59

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acc ggt ctc agt aat att ttc tcg gac aag aaa gac ggc ggg cag tat      2832
Thr Gly Leu Ser Asn Ile Phe Ser Asp Lys Lys Asp Gly Gly Gln Tyr
    930                     935                 940

atg cga tgc aaa aca ggt atg cag tcg att tgc cat gcc atg tca aag      2880
Met Arg Cys Lys Thr Gly Met Gln Ser Ile Cys His Ala Met Ser Lys
945                     950                 955                 960

gaa ctt gtt cca ggc tca gtg cac ctc aac acc ccc gtc gct gaa att      2928
Glu Leu Val Pro Gly Ser Val His Leu Asn Thr Pro Val Ala Glu Ile
                965                 970                 975

gag cag tcg gca tcc ggc tgt aca gta cga tcg gcc tcg ggc gcc gtg      2976
Glu Gln Ser Ala Ser Gly Cys Thr Val Arg Ser Ala Ser Gly Ala Val
            980                 985                 990

ttc cga agc aaa aag gtg gtg gtt tcg tta ccg aca acc ttg tat ccc      3024
Phe Arg Ser Lys Lys Val Val Val Ser Leu Pro Thr Thr Leu Tyr Pro
        995                 1000                1005

acc ttg aca ttt tca cca cct ctt ccc gcc gag aag caa gca ttg gcg      3072
Thr Leu Thr Phe Ser Pro Pro Leu Pro Ala Glu Lys Gln Ala Leu Ala
    1010                1015                1020

gaa aat tct atc ctg ggc tac tat agc aag ata gtc ttc gta tgg gac      3120
Glu Asn Ser Ile Leu Gly Tyr Tyr Ser Lys Ile Val Phe Val Trp Asp
1025                1030                1035                1040

aag ccg tgg tgg cgc gaa caa ggc ttc tcg ggc gtc ctc caa tcg agc      3168
Lys Pro Trp Trp Arg Glu Gln Gly Phe Ser Gly Val Leu Gln Ser Ser
                1045                1050                1055

tgt gac ccc atc tca ttt gcc aga gat acc agc atc gac gtc gat cga      3216
Cys Asp Pro Ile Ser Phe Ala Arg Asp Thr Ser Ile Asp Val Asp Arg
                1060                1065                1070

caa tgg tcc att acc tgt ttc atg gtc gga gac ccg gga cgg aag tgg      3264
Gln Trp Ser Ile Thr Cys Phe Met Val Gly Asp Pro Gly Arg Lys Trp
            1075                1080                1085

tcc caa cag tcc aag cag gta cga caa aag tct gtc tgg gac caa ctc      3312
Ser Gln Gln Ser Lys Gln Val Arg Gln Lys Ser Val Trp Asp Gln Leu
    1090                1095                1100

cgc gca gcc tac gag aac gcc ggg gcc caa gtc cca gag ccg gcc aac      3360
Arg Ala Ala Tyr Glu Asn Ala Gly Ala Gln Val Pro Glu Pro Ala Asn
1105                1110                1115                1120

gtg ctc gaa atc gag .tgg tcg aag cag cag tat ttc caa gga gct ccg     3408
Val Leu Glu Ile Glu Trp Ser Lys Gln Gln Tyr Phe Gln Gly Ala Pro
                1125                1130                1135

agc gcc gtc tat ggg ctg aac gat ctc atc aca ctg ggt tcg gcg ctc      3456
Ser Ala Val Tyr Gly Leu Asn Asp Leu Ile Thr Leu Gly Ser Ala Leu
            1140                1145                1150

aga acg ccg ttc aag agt gtt cat ttc gtt gga acg gag acg tct tta      3504
Arg Thr Pro Phe Lys Ser Val His Phe Val Gly Thr Glu Thr Ser Leu
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60

gtt tgg aaa ggg tat atg gaa ggg gcc ata cga tcg ggt caa cga ggt   3552
Val Trp Lys Gly Tyr Met Glu Gly Ala Ile Arg Ser Gly Gln Arg Gly
    1170   1175   1180

gct gca gaa gtt gtg gct agc ctg gtg cca gca gca tag   3591
Ala Ala Glu Val Val Ala Ser Leu Val Pro Ala Ala
1185   1190   1195

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Thr Arg Leu Leu Leu Glu Tyr Leu Glu Glu Lys Tyr Glu Glu His Leu
        20   25   30
Tyr Glu Arg Asp Glu Gly Asp Lys Trp Arg Asn Lys Lys Phe Glu Leu
        35   40   45
Gly Leu Glu Phe Pro Asn Leu Pro Tyr Tyr Ile Asp Gly Asp Val Lys
    50   55   60
Leu Thr Gln Ser Met Ala Ile Ile Arg Tyr Ile Ala Asp Lys His Asn
65   70   75   80
Met Leu Gly Gly Cys Pro Lys Glu Arg Ala Glu Ile Ser Met Leu Glu
            85   90   95
Gly Ala Val Leu Asp Ile Arg Tyr Gly Val Ser Arg Ile Ala Tyr Ser
        100   105   110
Lys Asp Phe Glu Thr Leu Lys Val Asp Phe Leu Ser Lys Leu Pro Glu
        115   120   125
Met Leu Lys Met Phe Glu Asp Arg Leu Cys His Lys Thr Tyr Leu Asn
    130   135   140
Gly Asp His Val Thr His Pro Asp Phe Met Leu Tyr Asp Ala Leu Asp
145   150   155   160
Val Val Leu Tyr Met Asp Pro Met Cys Leu Asp Ala Phe Pro Lys Leu
            165   170   175
Val Cys Phe Lys Lys Arg Ile Glu Ala Ile Pro Gln Ile Asp Lys Tyr
            180   185   190
Leu Lys Ser Ser Lys Tyr Ile Ala Trp Pro Leu Gln Gly Trp Gln Ala
        195   200   205
Thr Phe Gly Gly Gly Asp His Pro Pro Lys Ser Asp Leu Val Pro Arg
    210   215   220
Gly Ser Pro Glu Phe Thr Asp Phe Pro Val Arg Arg Thr Asp Leu Gly
225   230   235   240
Gln Val Gln Gly Leu Ala Gly Asp Val Met Ser Phe Arg Gly Ile Pro
            245   250   255
Tyr Ala Ala Pro Pro Val Gly Gly Leu Arg Trp Lys Pro Pro Gln His
            260   265   270
Ala Arg Pro Trp Ala Gly Val Arg Pro Ala Thr Gln Phe Gly Ser Asp
        275   280   285
Cys Phe Gly Ala Ala Tyr Leu Arg Lys Gly Ser Leu Ala Pro Gly Val
    290   295   300
Ser Glu Asp Cys Leu Tyr Leu Asn Val Trp Ala Pro Ser Gly Ala Lys
305   310   315   320
Pro Gly Gln Tyr Pro Val Met Val Trp Val Tyr Gly Gly Gly Phe Ala
                            61

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                     325                         330                         335
Gly Gly Thr Ala Ala Met Pro Tyr Tyr Asp Gly Glu Ala Leu Ala Arg
             340                         345                         350
Gln Gly Val Val Val Val Thr Phe Asn Tyr Arg Thr Asn Ile Leu Gly
             355                         360                         365
Phe Phe Ala His Pro Gly Leu Ser Arg Glu Ser Pro Thr Gly Thr Ser
     370                         375                         380
Gly Asn Tyr Gly Leu Leu Asp Ile Leu Ala Ala Leu Arg Trp Val Gln
385                         390                         395                         400
Ser Asn Ala Arg Ala Phe Gly Gly Asp Pro Gly Arg Val Thr Val Phe
                     405                         410                         415
Gly Glu Ser Ala Gly Ala Ser Ala Ile Gly Leu Leu Leu Thr Ser Pro
             420                         425                         430
Leu Ser Lys Gly Leu Phe Arg Gly Ala Ile Leu Glu Ser Pro Gly Leu
             435                         440                         445
Thr Arg Pro Leu Ala Thr Leu Ala Asp Ser Ala Ala Ser Gly Glu Arg
     450                         455                         460
Leu Asp Ala Asp Leu Ser Arg Leu Arg Ser Thr Asp Pro Ala Thr Leu
465                         470                         475                         480
Met Ala Arg Ala Asp Ala Ala Arg Pro Ala Ser Arg Asp Leu Arg Arg
             485                         490                         495
Pro Arg Pro Thr Gly Pro Ile Val Asp Gly His Val Leu Pro Gln Thr
             500                         505                         510
Asp Ser Ala Ala Ile Ala Ala Gly Gln Leu Ala Pro Val Arg Val Leu
             515                         520                         525
Ile Gly Thr Asn Ala Asp Glu Gly Arg Ala Phe Leu Gly Arg Ala Pro
     530                         535                         540
Met Glu Thr Pro Ala Asp Tyr Gln Ala Tyr Leu Glu Ala Gln Phe Gly
545                         550                         555                         560
Asp Gln Ala Ala Ala Val Ala Ala Cys Tyr Pro Leu Asp Gly Arg Ala
             565                         570                         575
Thr Pro Lys Glu Met Val Ala Arg Ile Phe Gly Asp Asn Gln Phe Asn
             580                         585                         590
Arg Gly Val Ser Ala Phe Ser Glu Ala Leu Val Arg Gln Gly Ala Pro
             595                         600                         605
Val Trp Arg Tyr Gln Phe Asn Gly Asn Thr Glu Gly Gly Arg Ala Pro
     610                         615                         620
Ala Thr His Gly Ala Glu Ile Pro Tyr Val Phe Gly Val Phe Lys Leu
625                         630                         635                         640
Asp Glu Leu Gly Leu Phe Asp Trp Pro Pro Glu Gly Pro Thr Pro Ala
             645                         650                         655
Asp Arg Ala Leu Gly Gln Leu Met Ser Ser Ala Trp Val Arg Phe Ala
             660                         665                         670
Lys Asn Gly Asp Pro Ala Gly Asp Ala Leu Thr Trp Pro Ala Tyr Ser
             675                         680                         685
Thr Gly Lys Ser Thr Met Thr Phe Gly Pro Glu Gly Arg Ala Ala Val
     690                         695                         700
Val Ser Pro Gly Pro Ser Ile Pro Pro Cys Ala Asp Gly Ala Lys Ala
705                         710                         715                         720
Gly Gly Gly Gly Ser Gly Gly Gly Ser Gly Gly Ser Lys Asp Asn
             725                         730                         735
Val Ala Asp Val Val Val Val Gly Ala Gly Leu Ser Gly Leu Glu Thr
             740                         745                         750
Ala Arg Lys Val Gln Ala Ala Gly Leu Ser Cys Leu Val Leu Glu Ala
             755                         760                         765
Met Asp Arg Val Gly Gly Lys Thr Leu Ser Val Gln Ser Gly Pro Gly
     770                         775                         780
Arg Thr Thr Ile Asn Asp Leu Gly Ala Ala Trp Ile Asn Asp Ser Asn
                                      62
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785                 790                 795                 800
Gln Ser Glu Val Ser Arg Leu Phe Glu Arg Phe His Leu Glu Gly Glu
                805                 810                 815
Leu Gln Arg Thr Thr Gly Asn Ser Ile His Gln Ala Gln Asp Gly Thr
            820                 825                 830
Thr Thr Thr Ala Pro Tyr Gly Asp Ser Leu Leu Ser Glu Glu Val Ala
        835                 840                 845
Ser Ala Leu Ala Glu Leu Leu Pro Val Trp Ser Gln Leu Ile Glu Glu
    850                 855                 860
His Ser Leu Gln Asp Leu Lys Ala Ser Pro Gln Ala Lys Arg Leu Asp
865                 870                 875                 880
Ser Val Ser Phe Ala His Tyr Cys Glu Lys Glu Leu Asn Leu Pro Ala
                885                 890                 895
Val Leu Gly Val Ala Asn Gln Ile Thr Arg Ala Leu Leu Gly Val Glu
            900                 905                 910
Ala His Glu Ile Ser Met Leu Phe Leu Thr Asp Tyr Ile Lys Ser Ala
        915                 920                 925
Thr Gly Leu Ser Asn Ile Phe Ser Asp Lys Lys Asp Gly Gly Gln Tyr
    930                 935                 940
Met Arg Cys Lys Thr Gly Met Gln Ser Ile Cys His Ala Met Ser Lys
945                 950                 955                 960
Glu Leu Val Pro Gly Ser Val His Leu Asn Thr Pro Val Ala Glu Ile
                965                 970                 975
Glu Gln Ser Ala Ser Gly Cys Thr Val Arg Ser Ala Ser Gly Ala Val
            980                 985                 990
Phe Arg Ser Lys Lys Val Val Val Ser Leu Pro Thr Thr Leu Tyr Pro
        995                 1000                1005
Thr Leu Thr Phe Ser Pro Pro Leu Pro Ala Glu Lys Gln Ala Leu Ala
    1010                1015                1020
Glu Asn Ser Ile Leu Gly Tyr Tyr Ser Lys Ile Val Phe Val Trp Asp
1025                1030                1035                1040
Lys Pro Trp Trp Arg Glu Gln Gly Phe Ser Gly Val Leu Gln Ser Ser
                1045                1050                1055
Cys Asp Pro Ile Ser Phe Ala Arg Asp Thr Ser Ile Asp Val Asp Arg
            1060                1065                1070
Gln Trp Ser Ile Thr Cys Phe Met Val Gly Asp Pro Gly Arg Lys Trp
            1075                1080                1085
Ser Gln Gln Ser Lys Gln Val Arg Gln Lys Ser Val Trp Asp Gln Leu
    1090                1095                1100
Arg Ala Ala Tyr Glu Asn Ala Gly Ala Gln Val Pro Glu Pro Ala Asn
1105                1110                1115                1120
Val Leu Glu Ile Glu Trp Ser Lys Gln Gln Tyr Phe Gln Gly Ala Pro
            1125                1130                1135
Ser Ala Val Tyr Gly Leu Asn Asp Leu Ile Thr Leu Gly Ser Ala Leu
            1140                1145                1150
Arg Thr Pro Phe Lys Ser Val His Phe Val Gly Thr Glu Thr Ser Leu
        1155                1160                1165
Val Trp Lys Gly Tyr Met Glu Gly Ala Ile Arg Ser Gly Gln Arg Gly
    1170                1175                1180
Ala Ala Glu Val Val Ala Ser Leu Val Pro Ala Ala
1185                1190                1195

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            glycosylation sites

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Met Ala Leu Ala Pro Ser Tyr Ile Asn Pro Pro Asn Val Ala Ser Pro
1               5                   10                  15

gca ggg tat tct cac gtc ggc gta ggc cca gac gga ggg agg tat gtg        96
Ala Gly Tyr Ser His Val Gly Val Gly Pro Asp Gly Gly Arg Tyr Val
                20                  25                  30

aca ata gct gga cag att gga caa gac gct tcg ggc gtg aca gac cct       144
Thr Ile Ala Gly Gln Ile Gly Gln Asp Ala Ser Gly Val Thr Asp Pro
            35                  40                  45

gcc tac gag aaa cag gtt gcc caa gca ttc gcc aat ctg cga gct tgc       192
Ala Tyr Glu Lys Gln Val Ala Gln Ala Phe Ala Asn Leu Arg Ala Cys
        50                  55                  60

ctt gct gca gtt gga gcc act tca aac gac gtc acc aag ctc aat tac       240
Leu Ala Ala Val Gly Ala Thr Ser Asn Asp Val Thr Lys Leu Asn Tyr
65                  70                  75                  80

tac atc gtc gac tac gcc ccg agc aaa ctc acc gca att gga gat ggg       288
Tyr Ile Val Asp Tyr Ala Pro Ser Lys Leu Thr Ala Ile Gly Asp Gly
                85                  90                  95

ctg aag gct acc ttt gcc ctt gac agg ctc cct cct tgc acg ctg gtg       336
Leu Lys Ala Thr Phe Ala Leu Asp Arg Leu Pro Pro Cys Thr Leu Val
            100                 105                 110

cca gtg tcg gcc ttg tct tca cct gaa tac ctc ttt gag gtt gat gcc       384
Pro Val Ser Ala Leu Ser Ser Pro Glu Tyr Leu Phe Glu Val Asp Ala
            115                 120                 125

acg gcg ctg gtg ccg gga cac acg acc cca gac aac gtt gcg gac gtg       432
Thr Ala Leu Val Pro Gly His Thr Thr Pro Asp Asn Val Ala Asp Val
        130                 135                 140

gta gtg gtg ggc gct ggc ttg agc ggt ttg gag acg gca cgc aaa gtc       480
Val Val Val Gly Ala Gly Leu Ser Gly Leu Glu Thr Ala Arg Lys Val
145                 150                 155                 160

cag gcc gcc ggt ctg tcc tgc ctc gtt ctt gag gcg atg gat cgt gta       528
Gln Ala Ala Gly Leu Ser Cys Leu Val Leu Glu Ala Met Asp Arg Val
                165                 170                 175

ggg gga aag act ctg agc gta caa tcg ggt ccc ggc agg acg act atc       576
Gly Gly Lys Thr Leu Ser Val Gln Ser Gly Pro Gly Arg Thr Thr Ile
            180                 185                 190

aac gac ctc ggc gct gcg tgg atc aat gat agc aat cag gcc gaa gta       624
Asn Asp Leu Gly Ala Ala Trp Ile Asn Asp Ser Asn Gln Ala Glu Val
        195                 200                 205
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64

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tcc aga ttg ttt gaa aga ttt cat ttg gag ggc gag ctc cag agg acg      672
Ser Arg Leu Phe Glu Arg Phe His Leu Glu Gly Glu Leu Gln Arg Thr
    210             215             220

act gga aat tca atc cat caa gca caa gac ggt aca acc act aca gct      720
Thr Gly Asn Ser Ile His Gln Ala Gln Asp Gly Thr Thr Thr Thr Ala
225             230             235             240

cct tat ggt gac tcc ttg ctg agc gag gag gtt gca agt gca ctt gcg      768
Pro Tyr Gly Asp Ser Leu Leu Ser Glu Glu Val Ala Ser Ala Leu Ala
                245             250             255

gaa ctc ctc ccc gta tgg tct cag ctg atc gaa gag cat agc ctt caa      816
Glu Leu Leu Pro Val Trp Ser Gln Leu Ile Glu Glu His Ser Leu Gln
                260             265             270

gac ctc aag gcg agc cct cag gcg aag cgg ctc gac agt gtg agc ttc      864
Asp Leu Lys Ala Ser Pro Gln Ala Lys Arg Leu Asp Ser Val Ser Phe
            275             280             285

gcg cac tac tgt gag aag gaa cta aac ttg cct gct gtt ctc ggc gta      912
Ala His Tyr Cys Glu Lys Glu Leu Asn Leu Pro Ala Val Leu Gly Val
    290             295             300

gca aac cag atc aca cgc gct ctg ctc ggt gtg gaa gcc cac gag atc      960
Ala Asn Gln Ile Thr Arg Ala Leu Leu Gly Val Glu Ala His Glu Ile
305             310             315             320

agc atg ctt ttt ctc acc gac tac atc aag agt gcc acc ggt ctc agt     1008
Ser Met Leu Phe Leu Thr Asp Tyr Ile Lys Ser Ala Thr Gly Leu Ser
                325             330             335

aat att ttc tcg gac aag aaa gac ggc ggg cag tat atg cga tgc aaa     1056
Asn Ile Phe Ser Asp Lys Lys Asp Gly Gly Gln Tyr Met Arg Cys Lys
            340             345             350

aca ggt atg cag tcg att tgc cat gcc atg tca aag gaa ctt gtt cca     1104
Thr Gly Met Gln Ser Ile Cys His Ala Met Ser Lys Glu Leu Val Pro
            355             360             365

ggc tca gtg cac ctc aac acc ccc gtc gct gaa att gag cag tcg gca     1152
Gly Ser Val His Leu Asn Thr Pro Val Ala Glu Ile Glu Gln Ser Ala
    370             375             380

tcc ggc tgt aca gta cga tcg gcc tcg ggc gcc gtg ttc cga agc aaa     1200
Ser Gly Cys Thr Val Arg Ser Ala Ser Gly Ala Val Phe Arg Ser Lys
385             390             395             400

aag gtg gtg gtt tcg tta ccg aca acc ttg tat ccc acc ttg aca ttt     1248
Lys Val Val Val Ser Leu Pro Thr Thr Leu Tyr Pro Thr Leu Thr Phe
                405             410             415

tca cca cct ctt ccc gcc gag aag caa gca ttg gcg gaa aat tct atc     1296
Ser Pro Pro Leu Pro Ala Glu Lys Gln Ala Leu Ala Glu Asn Ser Ile
            420             425             430

ctg ggc tac tat agc aag ata gtc ttc gta tgg gac aag ccg tgg tgg     1344
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65

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Leu Gly Tyr Tyr Ser Lys Ile Val Phe Val Trp Asp Lys Pro Trp Trp
        435                 440                 445

cgc gaa caa ggc ttc tcg ggc gtc ctc caa tcg agc tgt gac ccc atc     1392
Arg Glu Gln Gly Phe Ser Gly Val Leu Gln Ser Ser Cys Asp Pro Ile
        450                 455                 460

tca ttt gcc aga gat acc agc atc gac gtc gat cga caa tgg tcc att     1440
Ser Phe Ala Arg Asp Thr Ser Ile Asp Val Asp Arg Gln Trp Ser Ile
465                 470                 475                 480

acc tgt ttc atg gtc gga gac ccg gga cgg aag tgg tcc caa cag tcc     1488
Thr Cys Phe Met Val Gly Asp Pro Gly Arg Lys Trp Ser Gln Gln Ser
                485                 490                 495

aag cag gta cga caa aag tct gtc tgg gac caa ctc cgc gca gcc tac     1536
Lys Gln Val Arg Gln Lys Ser Val Trp Asp Gln Leu Arg Ala Ala Tyr
                500                 505                 510

gag aac gcc ggg gcc caa gtc cca gag ccg gcc aac gtg ctc gaa atc     1584
Glu Asn Ala Gly Ala Gln Val Pro Glu Pro Ala Asn Val Leu Glu Ile
            515                 520                 525

gag tgg tcg aag cag cag tat ttc caa gga gct ccg agc gcc gtc tat     1632
Glu Trp Ser Lys Gln Gln Tyr Phe Gln Gly Ala Pro Ser Ala Val Tyr
        530                 535                 540

ggg ctg aac gat ctc atc aca ctg ggt tcg gcg ctc aga acg ccg ttc     1680
Gly Leu Asn Asp Leu Ile Thr Leu Gly Ser Ala Leu Arg Thr Pro Phe
545                 550                 555                 560

aag agt gtt cat ttc gtt gga acg gag acg tct tta gtt tgg aaa ggg     1728
Lys Ser Val His Phe Val Gly Thr Glu Thr Ser Leu Val Trp Lys Gly
                565                 570                 575

tat atg gaa ggg gcc ata cga tcg ggt caa cga ggt gct gca gaa gtt     1776
Tyr Met Glu Gly Ala Ile Arg Ser Gly Gln Arg Gly Ala Ala Glu Val
                580                 585                 590

gtg gct agc ctg gtg cca gca gca tag                                 1803
Val Ala Ser Leu Val Pro Ala Ala  *
        595                 600


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            20                  25                  30
Thr Ile Ala Gly Gln Ile Gly Gln Asp Ala Ser Gly Val Thr Asp Pro
        35                  40                  45
Ala Tyr Glu Lys Gln Val Ala Gln Ala Phe Ala Asn Leu Arg Ala Cys
        50                  55                  60
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66

Leu Ala Ala Val Gly Ala Thr Ser Asn Asp Val Thr Lys Leu Asn Tyr
65   70   75   80
Tyr Ile Val Asp Tyr Ala Pro Ser Lys Leu Thr Ala Ile Gly Asp Gly
                85   90   95
Leu Lys Ala Thr Phe Ala Leu Asp Arg Leu Pro Pro Cys Thr Leu Val
            100   105   110
Pro Val Ser Ala Leu Ser Ser Pro Glu Tyr Leu Phe Glu Val Asp Ala
            115   120   125
Thr Ala Leu Val Pro Gly His Thr Thr Pro Asp Asn Val Ala Asp Val
        130   135   140
Val Val Val Gly Ala Gly Leu Ser Gly Leu Glu Thr Ala Arg Lys Val
145   150   155   160
Gln Ala Ala Gly Leu Ser Cys Leu Val Leu Glu Ala Met Asp Arg Val
                165   170   175
Gly Gly Lys Thr Leu Ser Val Gln Ser Gly Pro Gly Arg Thr Thr Ile
            180   185   190
Asn Asp Leu Gly Ala Ala Trp Ile Asn Asp Ser Asn Gln Ala Glu Val
            195   200   205
Ser Arg Leu Phe Glu Arg Phe His Leu Glu Gly Glu Leu Gln Arg Thr
    210   215   220
Thr Gly Asn Ser Ile His Gln Ala Gln Asp Gly Thr Thr Thr Thr Ala
225   230   235   240
Pro Tyr Gly Asp Ser Leu Leu Ser Glu Glu Val Ala Ser Ala Leu Ala
            245   250   255
Glu Leu Leu Pro Val Trp Ser Gln Leu Ile Glu Glu His Ser Leu Gln
            260   265   270
Asp Leu Lys Ala Ser Pro Gln Ala Lys Arg Leu Asp Ser Val Ser Phe
    275   280   285
Ala His Tyr Cys Glu Lys Glu Leu Asn Leu Pro Ala Val Leu Gly Val
    290   295   300
Ala Asn Gln Ile Thr Arg Ala Leu Leu Gly Val Glu Ala His Glu Ile
305   310   315   320
Ser Met Leu Phe Leu Thr Asp Tyr Ile Lys Ser Ala Thr Gly Leu Ser
            325   330   335
Asn Ile Phe Ser Asp Lys Lys Asp Gly Gly Gln Tyr Met Arg Cys Lys
            340   345   350
Thr Gly Met Gln Ser Ile Cys His Ala Met Ser Lys Glu Leu Val Pro
    355   360   365
Gly Ser Val His Leu Asn Thr Pro Val Ala Glu Ile Glu Gln Ser Ala
    370   375   380
Ser Gly Cys Thr Val Arg Ser Ala Ser Gly Ala Val Phe Arg Ser Lys
385   390   395   400
Lys Val Val Val Ser Leu Pro Thr Thr Leu Tyr Pro Thr Leu Thr Phe
            405   410   415
Ser Pro Pro Leu Pro Ala Glu Lys Gln Ala Leu Ala Glu Asn Ser Ile
            420   425   430
Leu Gly Tyr Tyr Ser Lys Ile Val Phe Val Trp Asp Lys Pro Trp Trp
            435   440   445
Arg Glu Gln Gly Phe Ser Gly Val Leu Gln Ser Ser Cys Asp Pro Ile
    450   455   460
Ser Phe Ala Arg Asp Thr Ser Ile Asp Val Asp Arg Gln Trp Ser Ile
465   470   475   480
Thr Cys Phe Met Val Gly Asp Pro Gly Arg Lys Trp Ser Gln Gln Ser
            485   490   495
Lys Gln Val Arg Gln Lys Ser Val Trp Asp Gln Leu Arg Ala Ala Tyr
            500   505   510
Glu Asn Ala Gly Ala Gln Val Pro Glu Pro Ala Asn Val Leu Glu Ile
            515   520   525

67

```
Glu Trp Ser Lys Gln Gln Tyr Phe Gln Gly Ala Pro Ser Ala Val Tyr
    530             535             540
Gly Leu Asn Asp Leu Ile Thr Leu Gly Ser Ala Leu Arg Thr Pro Phe
545             550             555             560
Lys Ser Val His Phe Val Gly Thr Glu Thr Ser Leu Val Trp Lys Gly
            565             570             575
Tyr Met Glu Gly Ala Ile Arg Ser Gly Gln Arg Gly Ala Ala Glu Val
        580             585             590
Val Ala Ser Leu Val Pro Ala Ala
        595             600


        <210> 34
        <211> 37
        <212> DNA
        <213> Artificial Sequence

        <220>
        <223> 37-mer oligonucleotide

        <400> 34
ggggaattca tggcacttgc accgagctac atcaatc                                  37


        <210> 35
        <211> 1929
        <212> DNA
        <213> Exophiala spinifera

        <220>
        <221> intron
        <222> (739)...(811)

        <221> intron
        <222> (1134)...(1186)

        <400> 35
atggcacttg caccgagcta catcaatccc ccaaacgtcg cctccccagc agggtattcc        60
cacatcggcg taggcccaaa cgaagcgagg tatgtgacaa tagctggaca gattggacaa       120
gacgctttgg gcgtgacaga cccagcctac gagaaacagg ttgcccaagc attcgccaat       180
ctgcgagctt gccttgctgc agttggagcc tcttcaaacg acgtcaccaa gctcaattac       240
tacatcgtcg actacgcccc gagcaaactc accgcaattg gagatgggct gaagtctacc       300
tttgcccttg acaggctccc tccttgcacg ctggtgccag taccggcctt ggcttcacct       360
gaatacctct ttgaggttga tgccacggcg ctggtgccag acactcgac cccagacaac        420
gttgcggacg tggtagtggt gggcgctggc ttgagcggtt tggagacggc acgcaaagtc       480
caggccgccg gtctgtcctg cctcgttctt gaggcgatgg atcgtgtagg gggaaagact       540
ctgagcgtac aatcgggtcc cggcaggacg actatcaacg acctcggcgc tgcgtggatc       600
aatgacagca accaaagcga agtatccaga ttgtttgaaa gatttcattt ggagggcgag       660
ctccagagga cgaccggaaa ttcaatccat caagcacaag acggtacaac cactacagct       720
ccttatggtg actccccggt aagcacaatc ccactttgtg atgagacctc tgtcgagtgt       780
agaatacagt cactgactcc acttcgtcca gctgagcgag gaggttgcaa gtgcacttgc       840
ggaactcctc cccgtatggt ctcagctgat cgaagagtat agccttgaag accccaaggc       900
gagccctcag gcgaagcggc tcgacagtgt gagcttcgcg cactactgtg agaaggacct       960
aaacttgcct gctgttctca gcgtggcaaa ccagatcaca cgcgctctgc tcggtgtgga      1020
agcccacgag atcagcatgc tttttctcac cgactacatc aagagtgcca ccggtctcag      1080
taatattgtc tcggacaaga aagacggcgg gcagtatatg cgatgcaaaa caggtgcgtg      1140
cggtgtcctc tcaggtaggg gactcgtttc ttagtggtca ttccaggtat gcagtcgatt      1200
tgccatgcca tgtcaaagga acttgttcca ggctcagtgc acctcaacac ccccgtcgct      1260
ggaattgagc agtcggcgtc cggctgtata gtacgatcgg cctcgggcgc cgtgttccga      1320
agcaaaaagg tggtggtttc gttaccgaca acattgtatc ccaccttgac attttcacca      1380
```

68

```
cctcttcccg ccgagaagca agcattggcg gaaaaatcta tcctcggcta ctatagcaag      1440
atagtcttcg tatgggacaa cccgtggtgg cgcgaacaag gcttctcggg cgtcctccaa      1500
tcgagctgtg accccatctc atttgccaga dataccagca tcgaagtcga tcggcaatgg      1560
tccattacct gtttcatggt cggagacccg ggacggaagt ggtcccaaca gtccaagcag      1620
gtacgacaaa agtctgtctg ggaccaactc cgcgcagcct acgagaacgc cggggcccaa      1680
gtcccagagc cggccaacgt gctcgaaatc gagtggtcga agcagcagta tttccaagga      1740
gctccgagcg ccgtctatgg gctgaacgat ctcatcacac tgggttcggc gctcagaacg      1800
ccgttcaagt gtgttcattt cgttggaacg gagacgtctt tagtttggaa agggtatatg      1860
gaaggggcca tacgatcggg tcaacgaggt gctgcagaag ttgtggctag cctggtgcca      1920
gcagcatag                                                             1929
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<210> 36
<211> 600
<212> PRT
<213> Exophiala spinifera

<400> 36

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Met Ala Leu Ala Pro Ser Tyr Ile Asn Pro Pro Asn Val Ala Ser Pro
1               5                   10                  15
Ala Gly Tyr Ser His Ile Gly Val Gly Pro Asn Glu Ala Arg Tyr Val
            20                  25                  30
Thr Ile Ala Gly Gln Ile Gly Gln Asp Ala Leu Gly Val Thr Asp Pro
        35              ·       40                  45
Ala Tyr Glu Lys Gln Val Ala Gln Ala Phe Ala Asn Leu Arg Ala Cys
        50                  55                  60
Leu Ala Ala Val Gly Ala Ser Ser Asn Asp Val Thr Lys Leu Asn Tyr
65                  70                  75                  80
Tyr Ile Val Asp Tyr Ala Pro Ser Lys Leu Thr Ala Ile Gly Asp Gly
                85                  90                  95
Leu Lys Ser Thr Phe Ala Leu Asp Arg Leu Pro Pro Cys Thr Leu Val
            100                 105                 110
Pro Val Pro Ala Leu Ala Ser Pro Glu Tyr Leu Phe Glu Val Asp Ala
        115                 120                 125
Thr Ala Leu Val Pro Gly His Ser Thr Pro Asp Asn Val Ala Asp Val
        130                 135                 140
Val Val Val Gly Ala Gly Leu Ser Gly Leu Glu Thr Ala Arg Lys Val
145                 150                 155                 160
Gln Ala Ala Gly Leu Ser Cys Leu Val Leu Glu Ala Met Asp Arg Val
                165                 170                 175
Gly Gly Lys Thr Leu Ser Val Gln Ser Gly Pro Gly Arg Thr Thr Ile
            180                 185                 190
Asn Asp Leu Gly Ala Ala Trp Ile Asn Asp Ser Asn Gln Ser Glu Val
            195                 200                 205
Ser Arg Leu Phe Glu Arg Phe His Leu Glu Gly Glu Leu Gln Arg Thr
210                 215                 220
Thr Gly Asn Ser Ile His Gln Ala Gln Asp Gly Thr Thr Thr Thr Ala
225                 230                 235                 240
Pro Tyr Gly Asp Ser Pro Leu Ser Glu Glu Val Ala Ser Ala Leu Ala
            245                 250                 255
Glu Leu Leu Pro Val Trp Ser Gln Leu Ile Glu Glu Tyr Ser Leu Glu
            260                 265                 270
Asp Pro Lys Ala Ser Pro Gln Ala Lys Arg Leu Asp Ser Val Ser Phe
            275                 280                 285
Ala His Tyr Cys Glu Lys Asp Leu Asn Leu Pro Ala Val Leu Ser Val
        290                 295                 300
Ala Asn Gln Ile Thr Arg Ala Leu Leu Gly Val Glu Ala His Glu Ile
305                 310                 315                 320
Ser Met Leu Phe Leu Thr Asp Tyr Ile Lys Ser Ala Thr Gly Leu Ser
```
69

Asn Ile Val Ser Asp Lys Lys Asp Gly Gly Gln Tyr Met Arg Cys Lys
            340   345   350
Thr Gly Met Gln Ser Ile Cys His Ala Met Ser Lys Glu Leu Val Pro
        355   360   365
Gly Ser Val His Leu Asn Thr Pro Val Ala Gly Ile Glu Gln Ser Ala
    370   375   380
Ser Gly Cys Ile Val Arg Ser Ala Ser Gly Ala Val Phe Arg Ser Lys
385   390   395   400
Lys Val Val Val Ser Leu Pro Thr Thr Leu Tyr Pro Thr Leu Thr Phe
            405   410   415
Ser Pro Pro Leu Pro Ala Glu Lys Gln Ala Leu Ala Glu Lys Ser Ile
            420   425   430
Leu Gly Tyr Tyr Ser Lys Ile Val Phe Val Trp Asp Asn Pro Trp Trp
        435   440   445
Arg Glu Gln Gly Phe Ser Gly Val Leu Gln Ser Ser Cys Asp Pro Ile
    450   455   460
Ser Phe Ala Arg Asp Thr Ser Ile Glu Val Asp Arg Gln Trp Ser Ile
465   470   475   480
Thr Cys Phe Met Val Gly Asp Pro Gly Arg Lys Trp Ser Gln Gln Ser
            485   490   495
Lys Gln Val Arg Gln Lys Ser Val Trp Asp Gln Leu Arg Ala Ala Tyr
        500   505   510
Glu Asn Ala Gly Ala Gln Val Pro Glu Pro Ala Asn Val Leu Glu Ile
        515   520   525
Glu Trp Ser Lys Gln Gln Tyr Phe Gln Gly Ala Pro Ser Ala Val Tyr
        530   535   540
Gly Leu Asn Asp Leu Ile Thr Leu Gly Ser Ala Leu Arg Thr Pro Phe
545   550   555   560
Lys Cys Val His Phe Val Gly Thr Glu Thr Ser Leu Val Trp Lys Gly
            565   570   575
Tyr Met Glu Gly Ala Ile Arg Ser Gly Gln Arg Gly Ala Ala Glu Val
        580   585   590
Val Ala Ser Leu Val Pro Ala Ala
        595   600

        <210> 37
        <211> 1929
        <212> DNA
        <213> Exophiala spinifera

        <220>
        <221> intron
        <222> (739)...(811)

        <221> intron
        <222> (1134)...(1186)

        <400> 37
atggcacttg caccgagcta catcaatccc ccaaacgtcg cctccccagc agggtattcc   60
cacatcggcg taggcccaaa cgaagcgagg tatgtgacaa tagctggaca gattggacaa   120
gacgctttgg gcgtgacaga cccagcctac gagaaacagg ttgcccaagc attcgccaat   180
ctgcgagctt gccttgctgc agttggagcc tcttcaaacg acgtcaccaa gctcaattac   240
tacatcgtcg actacgcccc gagcaaactc accgcaattg agatgggct gaagtctacc   300
tttgcccttg acaggctccc tccttgcacg ctggtgccag taccggcctt ggcttcacct   360
gaatacctct ttgaggttga cgccacggcg ctggtgccag acactcgac cccagacaac   420
gttgcggacg tggtagtggt gggcgctggc ttgagcggct tggagacggc acgcaaagtc   480
caggccgccg gtctgtcctg cctcgttctt gaggcgatgg atcgtgtagg gggaaagact   540

```
ctgagcgtac aatcgggtcc cggcaggacg actatcaacg acctcggcgc tgcgtggatc      600
aatgacagca accaaagcga agtatccaga ttgtttgaaa gatttcattt ggagggcgag      660
ctccagagga cgaccggaaa ttcaatccat caagcacaag acggtacaac cactacagct      720
ccttatggtg actccccggt aagcacaatc ccactttgtg atgagacctc tgtcgagtgt      780
agaatacagt cactgactcc acttcgtcca gctgagcgag gaggttgcaa gtgcacttgc      840
ggaactcctc cccgtatggt ctcagctgat cgaagagtat agccttgaag accccaaggc      900
gagccctcag gcgaagcggc tcgacagtgt gagcttcgcg cactactgtg agaaggacct      960
aaacttgcct gctgttctca gcgtggcaaa ccagatcaca cgcgctctgc tcggtgtgga     1020
agcccacgag atcagcatgc tttttctcac cgactacatc aagagtgcca ccggtctcag     1080
taatattgtc tcggacaaga aagacggcgg gcagtatatg cgatgcaaaa caggtgcgtg     1140
cggtgtcctc tcaggtaggg gactcgtttc ttagtggtca ttccaggtat gcagtcgatt     1200
tgccatgcca tgtcaaagga acttgttcca ggctcagtgc acctcaacac ccccgtcgct     1260
ggaattgagc agtcggcgtc cggctgtata gtacgatcgg cctcgggcgc cgtgttccga     1320
agcaaaaagg tggtggtttc gttaccgaca acattgtatc ccaccttgac attttcacca     1380
cctcttcccg ccgagaagca agcattggcg gaaaaatcta tcctcggcta ctatagcaag     1440
atagtcttcg tatgggacaa cccgtggtgg cgcgaacaag gcttctcggg cgtcctccaa     1500
tcgagctgtg accccatctc atttgccaga gataccagca tcgaagtcga tcggcaatgg     1560
tccattacct gtttcatggt cggagacccg ggacggaagt ggtcccaaca gtccaagcag     1620
gtacgacaaa agtctgtctg ggaccaactc cgcgcagcct acgagaacgc cggggcccaa     1680
gtcccagagc cggccaacgt gctcgaaatc gagtggtcga agcagcagta tttccaagga     1740
gctccgagcg ccgtctatgg gctgaacgat ctcatcacac tgggttcggc gctcagaacg     1800
ccgttcaagt gtgttcattt cgttggaacg gagacgtctt tagtttggaa agggtatatg     1860
gaaggggcca tacgatcggg tcaacgaggt gctgcagaag ttgtggctag cctggtgcca     1920
gcagcatag                                                             1929
```

          <210> 38
          <211> 600
          <212> PRT
          <213> Exophiala spinifera

          <400> 38
Met Ala Leu Ala Pro Ser Tyr Ile Asn Pro Pro Asn Val Ala Ser Pro
 1   5   10   15
Ala Gly Tyr Ser His Ile Gly Val Gly Pro Asn Glu Ala Arg Tyr Val
            20   25   30
Thr Ile Ala Gly Gln Ile Gly Gln Asp Ala Leu Gly Val Thr Asp Pro
         35   40   45
Ala Tyr Glu Lys Gln Val Ala Gln Ala Phe Ala Asn Leu Arg Ala Cys
      50   55   60
Leu Ala Ala Val Gly Ala Ser Ser Asn Asp Val Thr Lys Leu Asn Tyr
65   70   75   80
Tyr Ile Val Asp Tyr Ala Pro Ser Lys Leu Thr Ala Ile Gly Asp Gly
               85   90   95
Leu Lys Ser Thr Phe Ala Leu Asp Arg Leu Pro Pro Cys Thr Leu Val
            100   105   110
Pro Val Pro Ala Leu Ala Ser Pro Glu Tyr Leu Phe Glu Val Asp Ala
         115   120   125
Thr Ala Leu Val Pro Gly His Ser Thr Pro Asp Asn Val Ala Asp Val
         130   135   140
Val Val Val Gly Ala Gly Leu Ser Gly Leu Glu Thr Ala Arg Lys Val
145   150   155   160
Gln Ala Ala Gly Leu Ser Cys Leu Val Leu Glu Ala Met Asp Arg Val
               165   170   175
Gly Gly Lys Thr Leu Ser Val Gln Ser Gly Pro Gly Arg Thr Thr Ile
            180   185   190
Asn Asp Leu Gly Ala Ala Trp Ile Asn Asp Ser Asn Gln Ser Glu Val
            195   200   205
Ser Arg Leu Phe Glu Arg Phe His Leu Glu Gly Glu Leu Gln Arg Thr
                                71

```
            210                    215                      220
Thr Gly Asn Ser Ile His Gln Ala Gln Asp Gly Thr Thr Thr Thr Ala
225                      230                      235                      240
Pro Tyr Gly Asp Ser Pro Leu Ser Glu Glu Val Ala Ser Ala Leu Ala
                245                      250                      255
Glu Leu Leu Pro Val Trp Ser Gln Leu Ile Glu Glu Tyr Ser Leu Glu
                260                      265                      270
Asp Pro Lys Ala Ser Pro Gln Ala Lys Arg Leu Asp Ser Val Ser Phe
                275                      280                      285
Ala His Tyr Cys Glu Lys Asp Leu Asn Leu Pro Ala Val Leu Ser Val
                290                      295                      300
Ala Asn Gln Ile Thr Arg Ala Leu Leu Gly Val Glu Ala His Glu Ile
305                      310                      315                      320
Ser Met Leu Phe Leu Thr Asp Tyr Ile Lys Ser Ala Thr Gly Leu Ser
                325                      330                      335
Asn Ile Val Ser Asp Lys Lys Asp Gly Gly Gln Tyr Met Arg Cys Lys
                340                      345                      350
Thr Gly Met Gln Ser Ile Cys His Ala Met Ser Lys Glu Leu Val Pro
                355                      360                      365
Gly Ser Val His Leu Asn Thr Pro Val Ala Gly Ile Glu Gln Ser Ala
                370                      375                      380
Ser Gly Cys Ile Val Arg Ser Ala Ser Gly Ala Val Phe Arg Ser Lys
385                      390                      395                      400
Lys Val Val Val Ser Leu Pro Thr Thr Leu Tyr Pro Thr Leu Thr Phe
                405                      410                      415
Ser Pro Pro Leu Pro Ala Glu Lys Gln Ala Leu Ala Glu Lys Ser Ile
                420                      425                      430
Leu Gly Tyr Tyr Ser Lys Ile Val Phe Val Trp Asp Asn Pro Trp Trp
                435                      440                      445
Arg Glu Gln Gly Phe Ser Gly Val Leu Gln Ser Ser Cys Asp Pro Ile
                450                      455                      460
Ser Phe Ala Arg Asp Thr Ser Ile Glu Val Asp Arg Gln Trp Ser Ile
465                      470                      475                      480
Thr Cys Phe Met Val Gly Asp Pro Gly Arg Lys Trp Ser Gln Gln Ser
                485                      490                      495
Lys Gln Val Arg Gln Lys Ser Val Trp Asp Gln Leu Arg Ala Ala Tyr
                500                      505                      510
Glu Asn Ala Gly Ala Gln Val Pro Glu Pro Ala Asn Val Leu Glu Ile
                515                      520                      525
Glu Trp Ser Lys Gln Gln Tyr Phe Gln Gly Ala Pro Ser Ala Val Tyr
                530                      535                      540
Gly Leu Asn Asp Leu Ile Thr Leu Gly Ser Ala Leu Arg Thr Pro Phe
545                      550                      555                      560
Lys Cys Val His Phe Val Gly Thr Glu Thr Ser Leu Val Trp Lys Gly
                565                      570                      575
Tyr Met Glu Gly Ala Ile Arg Ser Gly Gln Arg Gly Ala Ala Glu Val
                580                      585                      590
Val Ala Ser Leu Val Pro Ala Ala
                595                      600

        <210> 39
        <211> 1930
        <212> DNA
        <213> Exophiala spinifera

        <220>
        <221> intron
        <222> (739)...(811)
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72

<221> intron
<222> (1134)...(1187)

<221> misc_feature
<222> (648)...(648)
<223> n = A,T,C or G

<400> 39

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atggcacttg caccgagcta catcaatccc ccaaacgtcg cctccccagc agggtattct       60
cacgtcggcg taggcccaga cggagggagg tatgtgacaa tagctggaca gattggacaa      120
gacgcttcgg gcgtgacaga ccctgcctac gagaaacagg ttgcccaagc attcgccaat      180
ctgcgagctt gccttgctgc agttggagcc acttcaaacg acgtcaccaa gctcaattac      240
tacatcgtcg actacgcccc gagcaaactc accgcaattg gagatgggct gaaggctacc      300
tttgcccttg acaggctccc tccttgcacg ctggtgccag tgtcggcctt gtcttcacct      360
gaatacctct ttgaggttga tgccacggcg ctggtgccgg dacacacgac cccagacaac      420
gttgcggacg tggtagtggt gggcgctggc ttgagcggtt tggagacggc acgcaaagtc      480
caggccgccg tctgtcctg cctcgttctt gaggcgatgg atcgtgtagg gggaaagact      540
ctgagcgtac aatcgggtcc cggcaggacg actatcaacg acctcggcgc tgcgtggatc      600
aatgacagca accaaagcga agtatccaga ttgtttgaaa gatttcatnt ggagggcgag      660
ctccagagga cgactggaaa ttcaatccat caagcacaag acggtacaac cactacagct      720
ccttatggtg actccttggt aagcacaatc ccactttgtg atgagacctc tgtcgagtgt      780
agaatacagt cactgattcc acttcgtcca gctgagcgag gaggttgcaa gtgcacttgc      840
ggaactcctc cccgtatggt ctcagctgat cgaagagcat agccttcaag acctcaaggc      900
gagccctcag gcgaagcggc tcgacagtgt gagcttcgcg cactactgtg agaaggaact      960
aaacttgcct gctgttctcg gcgtagcaaa ccagatcaca cgcgctctgc tcggtgtgga     1020
agcccacgag atcagcatgc tttttctcac cgactacatc aagagtgcca ccggtctcag     1080
taatattttc tcggacaaga aagacggcgg gcagtatatg cgatgcaaaa caggtgcgtg     1140
tggtgtcgtc tcaggtgggg gactcgtttc tcaagtggtc atttcaggta tgcagtcgat     1200
ttgccatgcc atgtcaaagg aacttgttcc aggctcagtg cacctcaaca ccccccgtcgc     1260
tgaaattgag cagtcggcat ccggctgtac agtacgatcg gcctcgggcg ccgtgttccg     1320
aagcaaaaag gtggtggttt cgttaccgac aaccttgtat cccaccttga cattttcacc     1380
acctctcccc gccgagaagc aagcattggc ggaaaattct atcctgggct actatagcaa     1440
gatagtcttc gtatgggaca agccgtggtg cgcgaacaa ggcttctcgg gcgtcctcca     1500
atcgagctgt gacccatct catttgccag agataccagc atcgacgtcg atcgacaatg     1560
gtccattacc tgtttcatgg tcggagaccc gggacggaag tggtcccaac agtccaagca     1620
ggtacgacaa aagtctgtct gggaccaact ccgcgcagcc tacgagaacg ccgggggccca     1680
agtcccagag ccggccaacg tgctcgaaat cgagtggtcg aagcagcagt atttccaagg     1740
agctccgagc gccgtctatg ggctgaacga tctcatcaca ctgggttcgg cgctcagaac     1800
gccgttcaag agtgttcatt tcgttggaac ggagacgtct ttagtttgga aagggtatat     1860
ggaagggggcc atacgatcgg gtcaacgagg tgctgcagaa gttgtggcta gcctggtgcc     1920
agcagcatag                                                            1930
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<210> 40
<211> 598
<212> PRT
<213> Exophiala spinifera

<220>
<221> VARIANT
<222> (216)...(216)
<223> Xaa = Any Amino Acid

<400> 40

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Met Ala Leu Ala Pro Ser Tyr Ile Asn Pro Pro Asn Val Ala Ser Pro
1               5                  10                  15
Ala Gly Tyr Ser His Val Gly Val Gly Pro Asp Gly Gly Arg Tyr Val
            20                  25                  30
```

73

```
Thr Ile Ala Gly Gln Ile Gly Gln Asp Ala Ser Gly Val Thr Asp Pro
    35                  40                  45
Ala Tyr Glu Lys Gln Val Ala Gln Ala Phe Ala Asn Leu Arg Ala Cys
    50                  55                  60
Leu Ala Ala Val Gly Ala Thr Ser Asn Asp Val Thr Lys Leu Asn Tyr
65                  70                  75                      80
Tyr Ile Val Asp Tyr Ala Pro Ser Lys Leu Thr Ala Ile Gly Asp Gly
                85                  90                  95
Leu Lys Ala Thr Phe Ala Leu Asp Arg Leu Pro Pro Cys Thr Leu Val
                100                 105                 110
Pro Val Ser Ala Leu Ser Ser Pro Glu Tyr Leu Phe Glu Val Asp Ala
                115                 120                 125
Thr Ala Leu Val Pro Gly His Thr Thr Pro Asp Asn Val Ala Asp Val
    130                  135                 140
Val Val Gly Ala Gly Leu Ser Gly Leu Glu Thr Ala Arg Lys Val Gln
145                 150                 155                 160
Ala Ala Gly Leu Ser Cys Leu Val Leu Glu Ala Met Asp Arg Val Gly
                165                 170                 175
Gly Lys Thr Leu Ser Val Gln Ser Gly Pro Gly Arg Thr Thr Ile Asn
                180                 185                 190
Asp Leu Gly Ala Ala Trp Ile Asn Asp Ser Asn Gln Ser Glu Val Ser
                195                 200                 205
Arg Leu Phe Glu Arg Phe His Xaa Glu Gly Glu Leu Gln Arg Thr Thr
    210                  215                 220
Gly Asn Ser Ile His Gln Ala Gln Asp Gly Thr Thr Thr Thr Ala Pro
225                 230                 235                 240
Tyr Gly Asp Ser Leu Leu Ser Glu Glu Val Ala Ser Ala Leu Ala Glu
                245                 250                 255
Leu Leu Pro Val Trp Ser Gln Leu Ile Glu Glu His Ser Leu Gln Asp
                260                 265                 270
Leu Lys Ala Ser Pro Gln Ala Lys Arg Leu Asp Ser Val Ser Phe Ala
    275                  280                 285
His Tyr Cys Glu Lys Glu Leu Asn Leu Pro Ala Val Leu Gly Val Asn
    290                  295                 300
Gln Ile Thr Arg Ala Leu Leu Gly Val Glu Ala His Glu Ile Ser Met
305                 310                 315                 320
Leu Phe Leu Thr Asp Tyr Ile Lys Ser Ala Thr Gly Leu Ser Asn Ile
                325                 330                 335
Phe Ser Asp Lys Lys Asp Gly Gly Gln Tyr Met Arg Cys Lys Thr Gly
                340                 345                 350
Met Gln Ser Ile Cys His Ala Met Ser Lys Glu Leu Val Pro Gly Ser
    355                  360                 365
Val His Leu Asn Thr Pro Val Ala Glu Ile Glu Gln Ser Ala Ser Gly
370                 375                 380
Cys Thr Val Arg Ser Ala Ser Gly Ala Val Phe Arg Ser Lys Lys Val
385                 390                 395                 400
Val Val Ser Leu Pro Thr Thr Leu Tyr Pro Thr Leu Thr Phe Ser Pro
                405                 410                 415
Pro Leu Pro Ala Glu Lys Gln Ala Leu Ala Glu Asn Ser Ile Leu Gly
                420                 425                 430
Tyr Tyr Ser Lys Ile Val Phe Val Trp Asp Lys Pro Trp Trp Arg Glu
                435                 440                 445
Gln Gly Phe Ser Gly Val Leu Gln Ser Ser Cys Asp Pro Ile Ser Phe
    450                  455                 460
Ala Arg Asp Thr Ser Ile Asp Val Asp Arg Gln Trp Ser Ile Thr Cys
465                 470                 475                 480
Phe Met Val Gly Asp Pro Gly Arg Lys Trp Ser Gln Gln Ser Lys Gln
                485                 490                 495
```

74

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Val Arg Gln Lys Ser Val Trp Asp Gln Leu Arg Ala Ala Tyr Glu Asn
            500                 505                 510
Ala Gly Ala Gln Val Pro Glu Pro Ala Asn Val Leu Glu Ile Glu Trp
            515                 520                 525
Ser Lys Gln Gln Tyr Phe Gln Gly Ala Pro Ser Ala Val Tyr Gly Leu
            530                 535                 540
Asn Asp Leu Ile Thr Leu Gly Ser Ala Leu Arg Thr Pro Phe Lys Ser
545                 550                 555                 560
Val His Phe Val Gly Thr Glu Thr Ser Leu Val Trp Lys Gly Tyr Met
            565                 570                 575
Glu Gly Ala Ile Arg Ser Gly Gln Arg Gly Ala Ala Glu Val Val Ala
            580                 585                 590
Ser Leu Val Pro Ala Ala
            595


        <210> 41
        <211> 1928
        <212> DNA
        <213> Rhinocladiella atrovirens

        <220>
        <221> intron
        <222> (739)...(811)

        <221> intron
        <222> (1134)...(1185)

        <400> 41
atggcacttg caccgagcta catcaatccc ccaaacctcg cctccccagc agggtattcc      60
cacgtcggcg taggcccaaa cggaggggagg tatgcgacaa tagctggaca gattggacaa     120
gacgcttcgg ccgtgacaga ccctgcctac gagaaacagg ttgcccaagc attcgccaac     180
ctgcgagctt gtcttgctgc agttggagcc acttcaaacg acattaccaa gctcaattac     240
tacatcgtcg actacaaccc gagcaaactc accgcaattg gagatgggct gaaggctacc     300
tttgcccttg acaggctccc tccttgcacg ctggtgccag tgccggccct ggcttcacct     360
gaataccct ttgaggttga tgccacggcg ctggttccag gacactcaac cccagacaat      420
gttgcggacg tggtcgtggt gggcgctggc ttgagcggtt tggagacggc acgcaaagtc     480
caggctgccg ggctgtcctg cctcgttctt gaggcgatgg atcgtgtggg gggaaagact     540
ctgagcgtac aatcgggtcc cggcaggacg gctatcaatg acctcggcgc tgcgtggatc     600
aatgacagca accaaagcga agtattcaaa ttatttgaaa gatttcattt ggagggcgag     660
ctccagagga cgaccggaaa ttcaatccat caagcacaag acggtacaac cactacagct     720
ccttatggtg attccctggt aagcacaatt ccatcttgtg atgagacctc tgtcgtgtgt     780
agaatacagt cgctgactcc acatcgtcca gctgagcgag gaggttgcaa gtgcactcgc     840
ggaactcctt cccgcatggt ctcagctgat cgaagagcat agtcttgaag accccaaggc     900
gagccctcaa gcgaagcagc tcgacagtgt gagcttcgca cactactgtg agaaggatct     960
aagcttgcct gctgttctcg gcgtggcaaa ccagatcaca cgcgctctgc tcggtgtgga    1020
agcccacgag atcagcatgc tttttctcac cgactacatc aagagtgcca ccggtctcag    1080
taatattgtc tcggataaga aagacggtgg gcagtatatg cgatgcaaaa caggtgcgtg    1140
tggtgttctc tcagtgggag actcgtttct tagtggtcat tccaggtatg cagtcgcttt    1200
gccatgccat gtcaaaggaa cttgttccag gctcagtgca cctcaacacc cccgtcgccg    1260
aaattgagca gtcggcatcc ggctgtacag tacgatcggc ctcgggcggc gtgttccgaa    1320
gtaaaaaggt ggtggtttcg ttaccgacaa ccttgtatcc caccttgata tttttcaccac   1380
ctcttcccgc cgagaagcaa gcattggctg aaaaatccat cctgggctac tatagcaaga    1440
tagtcttcgt atgggacaag ccgtggtggc gcgaacaagg cttctcgggc gtcctccaat    1500
cgagctgtga ccccatctca tttgccagag ataccagcat cgaagtcgat cggcaatggt    1560
ccattacctg tttcatggtc ggagacccgg gacggaagtg gtcccaacag tccaagcagg    1620
tacgacagaa gtctgtctgg aaccaactcc gcgcagccta cgagaacgcc ggggcccaag    1680
tcccagagcc ggccaacgtg ctcgagatcg agtggtcgaa gcagcagtat ttccaaggag    1740
cgccgagcgt cgtctatggg ctgaactgtc tcaacacact gggttcggcg ctcagaacgc    1800
                                    75
```

```
cgttcaaggg tgttcatttc gttggaacgg agacgtcttt ggtttggaaa gggtatatgg    1860
aaggggccat acgatcgggt cagcgaggcg ctgcagaagt tgtggctagc ctggtgccag    1920
cagcatag                                                             1928
```

        <210> 42
        <211> 598
        <212> PRT
        <213> Rhinocladiella atrovirens

        <400> 42

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Met Ala Leu Ala Pro Ser Tyr Ile Asn Pro Pro Asn Leu Ala Ser Pro
 1               5                  10                  15
Ala Gly Tyr Ser His Val Gly Val Gly Pro Asn Gly Gly Arg Tyr Ala
            20                  25                  30
Thr Ile Ala Gly Gln Ile Gly Gln Asp Ala Ser Ala Val Thr Asp Pro
        35                  40                  45
Ala Tyr Glu Lys Gln Val Ala Gln Ala Phe Ala Asn Leu Arg Ala Cys
    50                  55                  60
Leu Ala Ala Val Gly Ala Thr Ser Asn Asp Ile Thr Lys Leu Asn Tyr
65                  70                  75                  80
Tyr Ile Val Asp Tyr Asn Pro Ser Lys Leu Thr Ala Ile Gly Asp Gly
                85                  90                  95
Leu Lys Ala Thr Phe Ala Leu Asp Arg Leu Pro Pro Cys Thr Leu Val
            100                 105                 110
Pro Val Pro Ala Leu Ala Ser Pro Glu Tyr Pro Phe Glu Val Asp Ala
            115                 120                 125
Thr Ala Leu Val Pro Gly His Ser Thr Pro Asp Asn Val Ala Asp Val
130                 135                 140
Val Val Val Gly Ala Gly Leu Ser Gly Leu Glu Thr Ala Arg Lys Val
145                 150                 155                 160
Gln Ala Ala Gly Leu Ser Cys Leu Val Leu Glu Ala Met Asp Arg Val
            165                 170                 175
Gly Gly Lys Thr Leu Ser Val Gln Ser Gly Pro Gly Arg Thr Ala Ile
            180                 185                 190
Asn Asp Leu Gly Ala Ala Trp Ile Asn Asp Ser Asn Gln Ser Glu Val
            195                 200                 205
Phe Lys Leu Phe Glu Arg Leu Glu Gly Glu Leu Gln Arg Thr Thr Gly
210                 215                 220
Asn Ser Ile His Gln Ala Gln Asp Gly Thr Thr Thr Thr Ala Pro Tyr
225                 230                 235                 240
Gly Asp Ser Leu Leu Ser Glu Glu Val Ala Ser Ala Leu Ala Glu Leu
            245                 250                 255
Leu Pro Ala Trp Ser Gln Leu Ile Glu Glu His Ser Leu Glu Asp Pro
            260                 265                 270
Lys Ala Ser Pro Gln Ala Lys Gln Leu Asp Ser Val Ser Phe Ala His
            275                 280                 285
Tyr Cys Glu Lys Asp Leu Ser Leu Pro Ala Val Leu Gly Val Ala Asn
    290                 295                 300
Gln Ile Thr Arg Ala Leu Leu Gly Val Glu Ala His Glu Ile Ser Met
305                 310                 315                 320
Leu Phe Leu Thr Asp Tyr Ile Lys Ser Ala Thr Gly Leu Ser Asn Ile
            325                 330                 335
Val Ser Asp Lys Lys Asp Gly Gly Gln Tyr Met Arg Cys Lys Thr Gly
            340                 345                 350
Met Gln Ser Leu Cys His Ala Met Ser Lys Glu Leu Val Pro Gly Ser
            355                 360                 365
Val His Leu Asn Thr Pro Val Ala Glu Ile Glu Gln Ser Ala Ser Gly
    370                 375                 380
```
                                76

```
Cys Thr Val Arg Ser Ala Ser Gly Gly Val Phe Arg Ser Lys Lys Val
385             390             395             400
Val Val Ser Leu Pro Thr Thr Leu Tyr Pro Thr Leu Ile Phe Ser Pro
            405             410             415
Pro Leu Pro Ala Glu Lys Gln Ala Leu Ala Glu Lys Ser Ile Leu Gly
            420             425             430
Tyr Tyr Ser Lys Ile Val Phe Val Trp Asp Lys Pro Trp Trp Arg Glu
            435             440             445
Gln Gly Phe Ser Gly Val Leu Gln Ser Ser Cys Asp Pro Ile Ser Phe
            450             455             460
Ala Arg Asp Thr Ser Ile Glu Val Asp Arg Gln Trp Ser Ile Thr Cys
465             470             475             480
Phe Met Val Gly Asp Pro Gly Arg Lys Trp Ser Gln Gln Ser Lys Gln
            485             490             495
Val Arg Gln Lys Ser Val Trp Asn Gln Leu Arg Ala Ala Tyr Glu Asn
            500             505             510
Ala Gly Ala Gln Val Pro Glu Pro Ala Asn Val Leu Glu Ile Glu Trp
            515             520             525
Ser Lys Gln Gln Tyr Phe Gln Gly Ala Pro Ser Val Val Tyr Gly Leu
            530             535             540
Asn Cys Leu Asn Thr Leu Gly Ser Ala Leu Arg Thr Pro Phe Lys Gly
545             550             555             560
Val His Phe Val Gly Thr Glu Thr Ser Leu Val Trp Lys Gly Tyr Met
            565             570             575
Glu Gly Ala Ile Arg Ser Gly Gln Arg Gly Ala Ala Glu Val Val Ala
            580             585             590
Ser Leu Val Pro Ala Ala
            595


    <210> 43
    <211> 1928
    <212> DNA
    <213> Rhinocladiella atrovirens

    <220>
    <221> intron
    <222> (739)...(811)

    <221> intron
    <222> (1134)...(1186)

    <400> 43
atggcacttg caccgagcta catcaatccc ccaaacctcg cctccccagc agggtattcc    60
tacgtcggcg taggcccaaa cggagggagg tatgtgacaa tagctggaca gattggacaa   120
gacgcttcgg ccgtgacaga ccctgcctac gagaaacagg ttgcccaagc attcgccaac   180
ctgcgagctt gtcttgctgc agttggagcc acttcaaacg acattaccaa gctcaattac   240
tacatcgtcg actacaaccc gagcaaactc accgcaattg agatgggct gaaggctacc    300
tttgcccttg acaggctccc tccttgcacg ctggtgccag tgccggccct ggcttcacct   360
gaatacctct ttgaggttga tgccacggcg ctggttccag acactcaac cccagacaat    420
gttgcggacg tggtcgtggt gggcgctggc ttgagcggtt tggagacggc acgcaaagtc   480
caggctgccg ggctgtcctg cctcgttctt gaggcgatgg atcgtgtggg gggaaagact   540
ctgagcgtac aatcgggtcc cggcaggacg actatcaatg acctcggcgc tgcgtggatc   600
aatgacagca accaaagcga agtattcaaa ttatttgaaa gatttcattt ggagggcgag   660
ctccagagga cgaccggaaa ttcaatccat caagcacaag acggtacaac cactacagct   720
ccttatggtg attccctggt aagcacaatt ccatcttgtg atgagacctc tgtcgtgtgt   780
agaatacagt cgctgactcc acatcgtcca gctgagcgag gaggttgcaa gtgcactcgc   840
ggaactcctt cccgcatggt ctcagctgat cgaagagcat agtcttgaag accccaaggc   900
gagccctcaa gcgaagcagc tcgacagtgt gagcttcgca cactactgtg agaaggatct   960
                                    77
```

```
aaacttgcct gctgttctcg gcgtggcaaa ccagatcaca cgcgctctgc tcggtgtgga    1020
agcccacgag atcagcatgt tttttctcac cgactacatc aagagtgcca ccggtctcag    1080
taatattgtc tcggataaga aagacggtgg gcagtatatg cgatgcaaaa caggtgcgtg    1140
tggtgttctc tcagtgggag actcgtttct tagtggtcat tccaggtatg cagtcgcttt    1200
gccatgccat gtcaaaggaa cttgttccag gctcagtgca cctcaacacc cccgtcgccg    1260
aaattgagca gtcggcatcc ggctgtacag tacgatcggc ctcgggcggc gtgttccgaa    1320
gtaaaaaggt ggtggtttcg ttaccgacaa ccttgtatcc caccttgata ttttcaccac    1380
ctcttcccgc cgagaagcaa gcattggctg aaaaatccat cctgggctac tatagcaaga    1440
tagtcttcgt atgggacaag ccgtggtggc gcgaacaagg cttctcgggc gtcctccaat    1500
cgagctgtga ccccatctca tttgccagag ataccagcat cgaagtcgat cggcaatggt    1560
ccattacctg tttcatggtc ggagacccgg gacggaagtg gtcccaacag tccaagcagg    1620
tacgacagaa gtctgtctgg aaccaactcc gcgcagccta cgagaacgcc ggggcccaag    1680
tcccagagcc ggccaacgtg ctcgagatcg agtggtcgaa gcagcagtat ttccaaggag    1740
cgccgagcgc cgtctatggg ctgaactgtc tcaacacact gggttcggcg ctcagaacgc    1800
cgttcaaggg tgttcatttc gttggaacgg agacgtcttt ggtttggaaa gggtatatgg    1860
aagggggccat acgatcgggt cagcgaggcg ctgcagaagt tgtggctagc ctggtgccag    1920
cagcatag                                                             1928
```

        <210> 44
        <211> 591
        <212> PRT
        <213> Rhinocladiella atrovirens

        <400> 44
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Met Ala Leu Ala Pro Ser Tyr Ile Asn Pro Pro Asn Leu Ala Ser Pro
 1               5                  10                  15
Ala Gly Tyr Ser Tyr Val Gly Val Gly Pro Asn Gly Gly Arg Tyr Val
            20                  25                  30
Thr Ile Ala Gly Gln Ile Gly Gln Asp Ala Ser Ala Val Thr Asp Pro
        35                  40                  45
Ala Tyr Glu Lys Gln Val Ala Gln Ala Phe Ala Asn Leu Arg Ala Cys
    50                  55                  60
Leu Ala Ala Val Gly Ala Thr Ser Asn Asp Ile Thr Lys Leu Asn Tyr
65                  70                  75                  80
Tyr Ile Val Asp Tyr Asn Pro Ser Lys Leu Thr Ala Ile Gly Asp Gly
                85                  90                  95
Leu Lys Ala Thr Phe Ala Leu Asp Arg Leu Pro Pro Cys Thr Leu Val
            100                 105                 110
Pro Val Pro Ala Leu Ala Ser Pro Glu Tyr Leu Phe Glu Val Asp Ala
        115                 120                 125
Thr Ala Leu Val Pro Gly His Ser Thr Pro Asp Asn Val Ala Asp Val
    130                 135                 140
Val Val Val Gly Ala Gly Leu Ser Gly Leu Glu Thr Ala Arg Lys Val
145                 150                 155                 160
Gln Ala Ala Gly Leu Ser Cys Leu Val Leu Glu Ala Met Asp Arg Val
            165                 170                 175
Gly Gly Lys Thr Leu Ser Val Gln Ser Gly Gly Arg Thr Thr Ile Asn
            180                 185                 190
Asp Leu Gly Ala Ala Trp Ile Asn Asp Ser Asn Gln Ser Glu Val Lys
            195                 200                 205
Leu Phe Glu Arg Phe His Leu Glu Gly Glu Leu Gln Arg Thr Thr Gly
    210                 215                 220
Asn Ser Ile His Gln Ala Gln Asp Gly Thr Thr Thr Ala Pro Tyr
225                 230                 235                 240
Gly Ser Leu Leu Ser Glu Glu Val Ala Ser Ala Leu Ala Glu Leu Leu
            245                 250                 255
Pro Ala Ser Gln Leu Ile Glu Glu His Ser Leu Glu Asp Pro Lys Ala
            260                 265                 270
```
                                78

Ser Pro Gln Ala Lys Gln Leu Asp Ser Val Ser Phe Ala His Tyr Cys
     275   280   285
Glu Lys Leu Asn Leu Ala Val Leu Gly Val Ala Asn Gln Ile Thr Arg
     290   295   300
Ala Leu Leu Gly Val Glu Ala His Glu Ile Ser Met Phe Phe Leu Thr
305   310   315   320
Asp Tyr Ile Lys Ser Ala Thr Gly Leu Ser Asn Ile Val Ser Asp Lys
          325   330   335
Lys Asp Gly Gly Gln Tyr Met Arg Cys Lys Thr Gly Met Gln Ser Leu
          340   ·   345   350
Cys His Ala Met Ser Lys Glu Leu Val Pro Gly Ser Val His Leu Asn
          355   360   365
Thr Pro Val Ala Glu Ile Glu Gln Ser Ala Ser Gly Cys Thr Val Arg
     370   375   380
Ser Ala Ser Gly Gly Val Phe Arg Ser Lys Lys Val Val Leu Pro Thr
385   390   395   400
Leu Tyr Pro Thr Leu Ile Phe Ser Pro Pro Leu Pro Ala Glu Lys Gln
          405   410   415
Ala Leu Ala Glu Lys Ser Ile Leu Gly Tyr Tyr Ser Lys Ile Val Phe
          420   425   430
Val Trp Asp Lys Pro Trp Trp Arg Glu Gln Gly Phe Ser Gly Val Leu
          435   440   445
Gln Ser Ser Cys Asp Pro Ile Ser Phe Ala Arg Asp Thr Ser Ile Glu
     450   455   460
Val Asp Arg Gln Trp Ser Ile Thr Cys Phe Met Val Gly Asp Pro Gly
465   470   475   480
Arg Lys Trp Ser Gln Gln Ser Lys Gln Val Arg Gln Lys Ser Val Trp
          485   490   495
Asn Gln Leu Arg Ala Ala Tyr Glu Asn Ala Gly Ala Gln Val Pro Glu
          500   505   510
Pro Ala Asn Val Leu Glu Ile Glu Trp Ser Lys Gln Gln Tyr Phe Gln
          515   520   525
Gly Ala Pro Ser Ala Val Tyr Gly Leu Asn Cys Leu Asn Thr Leu Gly
     530   535   540
Ser Ala Leu Arg Thr Pro Phe Lys Gly Val His Phe Val Gly Thr Glu
545   550   555   560
Thr Ser Leu Val Trp Lys Gly Tyr Met Glu Gly Ala Ile Arg Ser Gly
          565   570   575
Gln Arg Gly Ala Ala Glu Val Val Ala Ser Leu Val Pro Ala Ala
          580   585   590

```
<210> 45
<211> 1928
<212> DNA
<213> Rhinocladiella atrovirens

<220>
<221> intron
<222> (739)...(811)

<221> intron
<222> (1134)...(1185)

<400> 45
atggcacttg caccgagcta catcaatccc ccaaacctcg cctccccagc agggtattcc      60
cacgtcggcg taggcccaaa cggagggagg tatgtgacaa tagctggaca gattggacaa     120
gacgcttcgg ccgtgacaga ccctgcctac gagaaacagg ttgcccaagc attcgccaac     180
ctgcgagctt gtcttgctgc agttggagcc acttcaaacg acattaccaa gctcaattac     240
```

```
tacatcgtcg actacaaccc gagcaaactc accgcaattg gagatgggct gaaggctacc    300
tttgccttg  acaggctccc tccttgcacg ctggtgccag tgccggccct ggcttcacct    360
gaatacctct ttgaggttga tgctacggcg ctggttccag gacactcaac cccagacaat    420
gttgcggacg tggtcgtggt gggcgctggc ttgagcggtt tggagacggc acgcaaagtc    480
caggctgccg ggctgtcctg cctcgttctt gaggcgatgg atcgtgtggg gggaaagact    540
ctgagcgtac aatcgggtcc cggcaggacg actatcaatg acctcggcgc tgcgtggatc    600
aatgacagca accaaagcga agtattcaaa ttatttgaaa gatttcattt ggagggcgag    660
ctccagagga cgaccggaaa ttcaatccat caagcacaag acggtacaac cactacagct    720
ccttatggtg attccctggt aggcacaatt ccatcttgtg atgagacctc tgtcgtgtgt    780
agaatacagt cgctgactcc acatcgtcca gctgagcgag gaggttgcaa gtgcactcgc    840
ggaactcctt cccgcatggt ctcagctgat cgaagagcat agtcttgaag accccaaggc    900
gagccctcaa gcgaagcagc tcgacagtgt gagcttcgca cactactgtg agaaggatct    960
aaacttgcct gctgttctcg gcgtggcaaa ccagatcaca cgcgctctgc tcggtgtgga   1020
agcccacgag atcagcatgc ttttttctcac cgactacatc aagagtgcca ccggtctcag   1080
taatattgtc tcggataaga aagacggtgg gcagtatatg cgatgcaaaa caggtgcgtg   1140
tggtgttctc tcagtgggag actcgtttct tagtggtcat tccaggtatg cagtcgcttt   1200
gccatgccat gtcaaaggaa cttgttccag gctcagtgca cctcaacacc cccgtcgccg   1260
aaattgagca gtcggcatcc ggctgtacag tacgatcggc tcgggcggc  gtgttccgaa   1320
gtaaaaaggt ggtggtttcg ttaccgacaa ccttgtatcc caccttgata ttttcaccac   1380
ctcttcccgc cgagaagcaa gcattggctg aaaaatccat cctgggctac tatagcaaga   1440
tagtcttcgt atgggacaag ctgtggtggc gcgaacaagg cttctcgggc gtcctccaat   1500
cgagctgtga ccccatctca tttgccagag ataccagcat cgaagtcgat cggcaatggt   1560
ccattacctg tttcatggtc ggagacccgg gacggaagtg gtcccaacag tccaagcagg   1620
tacgacagaa gtctgtctgg aaccaactcc gcgcagccta cgagaacgcc ggggcccaag   1680
tcccagagcc ggccaacgtg tcgagatcg  agtggtcgaa gcagcagtat ttccaaggag   1740
cgccgagcgc cgtctatggg ctgaactgtc tcaacacact gggttcggcg ctcagaacgc   1800
cgttcaaggg tgttcatttc gttggaacgg agacgtcttt ggtttggaaa gggtatatgg   1860
aaggggccat acgatcgggt cagcgaggcg ctgcagaagt tgtgcctagc ctggtgccag   1920
cagcatag                                                            1928
```

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        <210> 46
        <211> 591
        <212> PRT
        <213> Rhinocladiella atrovirens

        <400> 46
Met Ala Leu Ala Pro Ser Tyr Ile Asn Pro Pro Asn Ala Ser Pro Ala
1               5                   10                  15
Gly Tyr Ser His Val Gly Val Gly Pro Asn Gly Gly Arg Tyr Val Thr
                20                  25                  30
Ile Ala Gly Gln Ile Gly Gln Asp Ala Ser Ala Val Thr Asp Pro Ala
            35                  40                  45
Tyr Glu Lys Gln Val Ala Gln Ala Phe Ala Asn Leu Arg Ala Cys Leu
    50                  55                  60
Ala Ala Val Gly Ala Thr Ser Asn Asp Ile Thr Lys Leu Asn Tyr Tyr
65                  70                  75                  80
Ile Val Asp Tyr Asn Pro Ser Lys Leu Thr Ala Ile Gly Asp Gly Leu
                85                  90                  95
Lys Ala Thr Phe Ala Leu Asp Arg Leu Pro Pro Cys Thr Leu Val Pro
                100                 105                 110
Val Pro Ala Leu Ala Ser Pro Glu Tyr Leu Phe Glu Val Asp Ala Thr
            115                 120                 125
Ala Leu Val Pro Gly His Ser Thr Pro Asp Asn Val Ala Asp Val Val
        130                 135                 140
Val Val Gly Ala Gly Leu Ser Gly Leu Glu Thr Ala Arg Lys Val Gln
145                 150                 155                 160
Ala Ala Gly Leu Ser Cys Leu Val Leu Glu Ala Met Asp Arg Val Gly
                165                 170                 175
```

80

```
Gly Lys Thr Leu Ser Val Gln Ser Gly Pro Gly Arg Thr Thr Ile Asn
        180                 185                 190
Asp Leu Gly Ala Ala Trp Ile Asn Asp Ser Asn Gln Ser Glu Val Phe
        195                 200                 205
Lys Leu Phe Glu Arg Phe His Leu Glu Gly Glu Leu Gln Arg Thr Thr
    210                 215                 220
Gly Asn Ser Ile His Gln Ala Gln Asp Gly Thr Thr Thr Thr Ala Pro
225                 230                 235                 240
Tyr Gly Asp Ser Leu Leu Ser Glu Glu Val Ala Ser Ala Leu Ala Glu
                245                 250                 255
Leu Leu Pro Ala Trp Ser Gln Leu Ile Glu Glu His Ser Leu Glu Asp
        260                 265                 270
Pro Lys Ala Ser Pro Gln Ala Lys Gln Leu Asp Ser Val Ser Phe Ala
        275                 280                 285
His Tyr Cys Glu Lys Asp Leu Asn Leu Pro Ala Val Leu Gly Val Ala
    290                 295                 300
Asn Gln Ile Thr Arg Ala Leu Leu Gly Val Glu Ala His Glu Ile Ser
305                 310                 315                 320
Met Leu Phe Leu Thr Asp Tyr Ile Lys Ser Ala Thr Gly Leu Ser Asn
                325                 330                 335
Ile Val Ser Asp Lys Lys Asp Gly Gly Gln Tyr Met Arg Cys Lys Thr
                340                 345                 350
Gly Met Gln Ser Leu Cys His Ala Met Ser Lys Glu Leu Val Pro Gly
        355                 360                 365
Ser Val His Leu Asn Thr Pro Val Ala Glu Ile Glu Gln Ser Ala Ser
    370                 375                 380
Gly Cys Thr Val Arg Ser Ala Ser Gly Gly Val Phe Arg Ser Lys Lys
385                 390                 395                 400
Val Ser Leu Pro Thr Thr Leu Tyr Pro Thr Leu Ile Phe Ser Pro Leu
                405                 410                 415
Pro Ala Glu Lys Gln Ala Leu Ala Glu Lys Ser Ile Gly Tyr Tyr Ser
        420                 425                 430
Lys Ile Val Phe Val Asp Lys Leu Trp Trp Arg Glu Gln Gly Phe Ser
        435                 440                 445
Gly Val Leu Gln Ser Ser Cys Asp Pro Ile Ser Phe Ala Arg Asp Thr
    450                 455                 460
Ser Ile Glu Val Asp Arg Gln Ser Ile Thr Cys Phe Met Val Gly Asp
465                 470                 475                 480
Pro Arg Lys Trp Ser Gln Gln Ser Lys Gln Val Arg Gln Lys Ser Val
                485                 490                 495
Trp Asn Gln Leu Arg Ala Ala Tyr Glu Asn Ala Gly Ala Gln Val Pro
                500                 505                 510
Glu Pro Ala Asn Val Leu Glu Ile Glu Trp Ser Lys Gln Gln Tyr Phe
        515                 520                 525
Gln Ala Pro Ser Ala Val Tyr Gly Leu Asn Cys Leu Asn Thr Leu Gly
    530                 535                 540
Ser Ala Leu Arg Thr Pro Phe Lys Gly Val His Phe Val Gly Thr Glu
545                 550                 555                 560
Thr Ser Leu Val Trp Lys Gly Tyr Met Glu Gly Ala Ile Arg Ser Gly
                565                 570                 575
Gln Arg Gly Ala Ala Glu Val Val Pro Ser Leu Val Pro Ala Ala
        580                 585                     590

        <210> 47
        <211> 600
        <212> PRT
        <213> Exophiala spinifera
```

81

<400> 47

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Met Ala Leu Ala Pro Ser Tyr Ile Asn Pro Pro Asn Val Ala Ser Pro
  1               5                  10                  15
Ala Gly Tyr Ser His Val Gly Val Gly Pro Asp Gly Gly Arg Tyr Val
             20                  25                  30
Thr Ile Ala Gly Gln Ile Gly Gln Asp Ala Ser Gly Val Thr Asp Pro
         35                  40                  45
Ala Tyr Glu Lys Gln Val Ala Gln Ala Phe Ala Asn Leu Arg Ala Cys
     50                  55                  60
Leu Ala Ala Val Gly Ala Thr Ser Asn Asp Val Thr Lys Leu Asn Tyr
 65                  70                  75                  80
Tyr Ile Val Asp Tyr Ala Pro Ser Lys Leu Thr Ala Ile Gly Asp Gly
                 85                  90                  95
Leu Lys Ala Thr Phe Ala Leu Asp Arg Leu Pro Pro Cys Thr Leu Val
                100                 105                 110
Pro Val Ser Ala Leu Ser Ser Pro Glu Tyr Leu Phe Glu Val Asp Ala
            115                 120                 125
Thr Ala Leu Val Pro Gly His Thr Thr Pro Asp Asn Val Ala Asp Val
        130                 135                 140
Val Val Val Gly Ala Gly Leu Ser Gly Leu Glu Thr Ala Arg Lys Val
145                 150                 155                 160
Gln Ala Ala Gly Leu Ser Cys Leu Val Leu Glu Ala Met Asp Arg Val
                165                 170                 175
Gly Gly Lys Thr Leu Ser Val Gln Ser Gly Pro Gly Arg Thr Thr Ile
            180                 185                 190
Asn Asp Leu Gly Ala Ala Trp Ile Asn Asp Ser Asn Gln Ser Glu Val
            195                 200                 205
Ser Arg Leu Phe Glu Arg Phe His Leu Glu Gly Glu Leu Gln Arg Thr
    210                 215                 220
Thr Gly Asn Ser Ile His Gln Ala Gln Asp Gly Thr Thr Thr Thr Ala
225                 230                 235                 240
Pro Tyr Gly Asp Ser Leu Leu Ser Glu Glu Val Ala Ser Ala Leu Ala
                245                 250                 255
Glu Leu Leu Pro Val Trp Ser Gln Leu Ile Glu Glu His Ser Leu Gln
            260                 265                 270
Asp Leu Lys Ala Ser Pro Gln Ala Lys Arg Leu Asp Ser Val Ser Phe
        275                 280                 285
Ala His Tyr Cys Glu Lys Glu Leu Asn Leu Pro Ala Val Leu Gly Val
    290                 295                 300
Ala Asn Gln Ile Thr Arg Ala Leu Leu Gly Val Glu Ala His Glu Ile
305                 310                 315                 320
Ser Met Leu Phe Leu Thr Asp Tyr Ile Lys Ser Ala Thr Gly Leu Ser
            325                 330                 335
Asn Ile Phe Ser Asp Lys Lys Asp Gly Gly Gln Tyr Met Arg Cys Lys
        340                 345                 350
Thr Gly Met Gln Ser Ile Cys His Ala Met Ser Lys Glu Leu Val Pro
    355                 360                 365
Gly Ser Val His Leu Asn Thr Pro Val Ala Glu Ile Glu Gln Ser Ala
370                 375                 380
Ser Gly Cys Thr Val Arg Ser Ala Ser Gly Ala Val Phe Arg Ser Lys
385                 390                 395                 400
Lys Val Val Val Ser Leu Pro Thr Thr Leu Tyr Pro Thr Leu Thr Phe
                405                 410                 415
Ser Pro Pro Leu Pro Ala Glu Lys Gln Ala Leu Ala Glu Asn Ser Ile
            420                 425                 430
Leu Gly Tyr Tyr Ser Lys Ile Val Phe Val Trp Asp Lys Pro Trp Trp
            435                 440                 445
Arg Glu Gln Gly Phe Ser Gly Val Leu Gln Ser Ser Cys Asp Pro Ile
```

82

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          450                     455                     460
Ser Phe Ala Arg Asp Thr Ser Ile Asp Val Asp Arg Gln Trp Ser Ile
465                     470                     475                     480
Thr Cys Phe Met Val Gly Asp Pro Gly Arg Lys Trp Ser Gln Gln Ser
                    485                     490                     495
Lys Gln Val Arg Gln Lys Ser Val Trp Asp Gln Leu Arg Ala Ala Tyr
                500                     505                     510
Glu Asn Ala Gly Ala Gln Val Pro Glu Pro Ala Asn Val Leu Glu Ile
            515                     520                     525
Glu Trp Ser Lys Gln Gln Tyr Phe Gln Gly Ala Pro Ser Ala Val Tyr
            530                     535                     540
Gly Leu Asn Asp Leu Ile Thr Leu Gly Ser Ala Leu Arg Thr Pro Phe
545                     550                     555                     560
Lys Ser Val His Phe Val Gly Thr Glu Thr Ser Leu Val Trp Lys Gly
                    565                     570                     575
Tyr Met Glu Gly Ala Ile Arg Ser Gly Gln Arg Gly Ala Ala Glu Val
                580                  ·  585                     590
Val Ala Ser Leu Val Pro Ala Ala
            595                     600


        <210> 48
        <211> 1392
        <212> DNA
        <213> Unknown

        <220>
        <221> CDS
        <222> (1)...(1392)

        <223> Cys (-) APAO; removal of cysteine 461

        <400> 48
aaa gac aac gtt gcg gac gtg gta gtg gtg ggc gct ggc ttg agc ggt        48
Lys Asp Asn Val Ala Asp Val Val Val Val Gly Ala Gly Leu Ser Gly
 1               5                      10                      15

ttg gag acg gca cgc aaa gtc cag gcc gcc ggt ctg tcc tgc ctc gtt        96
Leu Glu Thr Ala Arg Lys Val Gln Ala Ala Gly Leu Ser Cys Leu Val
            20                      25                      30

ctt gag gcg atg gat cgt gta ggg gga aag act ctg agc gta caa tcg       144
Leu Glu Ala Met Asp Arg Val Gly Gly Lys Thr Leu Ser Val Gln Ser
            35                      40                      45     ·

ggt ccc ggc agg acg act atc aac gac ctc ggc gct gcg tgg atc aat       192
Gly Pro Gly Arg Thr Thr Ile Asn Asp Leu Gly Ala Ala Trp Ile Asn
        50                      55                      60

gac agc aac caa agc gaa gta tcc aga ttg ttt gaa aga ttt cat ttg       240
Asp Ser Asn Gln Ser Glu Val Ser Arg Leu Phe Glu Arg Phe His Leu
 65                      70                      75                      80

gag ggc gag ctc cag agg acg act gga aat tca atc cat caa gca caa       288
Glu Gly Glu Leu Gln Arg Thr Thr Gly Asn Ser Ile His Gln Ala Gln
                    85                      90                      95

gac ggt aca acc act aca gct cct tat ggt gac tcc ttg ctg agc gag       336
Asp Gly Thr Thr Thr Thr Ala Pro Tyr Gly Asp Ser Leu Leu Ser Glu
                              83
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```
gag gtt gca agt gca ctt gcg gaa ctc ctc ccc gta tgg tct cag ctg     384
Glu Val Ala Ser Ala Leu Ala Glu Leu Leu Pro Val Trp Ser Gln Leu
        115                120                125

atc gaa gag cat agc ctt caa gac ctc aag gcg agc cct cag gcg aag     432
Ile Glu Glu His Ser Leu Gln Asp Leu Lys Ala Ser Pro Gln Ala Lys
    130                135                140

cgg ctc gac agt gtg agc ttc gcg cac tac tgt gag aag gaa cta aac     480
Arg Leu Asp Ser Val Ser Phe Ala His Tyr Cys Glu Lys Glu Leu Asn
145                150                155                160

ttg cct gct gtt ctc ggc gta gca aac cag atc aca cgc gct ctg ctc     528
Leu Pro Ala Val Leu Gly Val Ala Asn Gln Ile Thr Arg Ala Leu Leu
                165                170                175

ggt gtg gaa gcc cac gag atc agc atg ctt ttt ctc acc gac tac atc     576
Gly Val Glu Ala His Glu Ile Ser Met Leu Phe Leu Thr Asp Tyr Ile
                180                185                190

aag agt gcc acc ggt ctc agt aat att ttc tcg gac aag aaa gac ggc     624
Lys Ser Ala Thr Gly Leu Ser Asn Ile Phe Ser Asp Lys Lys Asp Gly
                195                200                205

ggg cag tat atg cga tgc aaa aca ggt atg cag tcg att tgc cat gcc     672
Gly Gln Tyr Met Arg Cys Lys Thr Gly Met Gln Ser Ile Cys His Ala
        210                215                220

atg tca aag gaa ctt gtt cca ggc tca gtg cac ctc aac acc ccc gtc     720
Met Ser Lys Glu Leu Val Pro Gly Ser Val His Leu Asn Thr Pro Val
225                230                235                240

gct gaa att gag cag tcg gca tcc ggc tgt aca gta cga tcg gcc tcg     768
Ala Glu Ile Glu Gln Ser Ala Ser Gly Cys Thr Val Arg Ser Ala Ser
                245                250                255

ggc gcc gtg ttc cga agc aaa aag gtg gtg gtt tcg tta ccg aca acc     816
Gly Ala Val Phe Arg Ser Lys Lys Val Val Val Ser Leu Pro Thr Thr
                260                265                270

ttg tat ccc acc ttg aca ttt tca cca cct ctt ccc gcc gag aag caa     864
Leu Tyr Pro Thr Leu Thr Phe Ser Pro Pro Leu Pro Ala Glu Lys Gln
        275                280                285

gca ttg gcg gaa aat tct atc ctg ggc tac tat agc aag ata gtc ttc     912
Ala Leu Ala Glu Asn Ser Ile Leu Gly Tyr Tyr Ser Lys Ile Val Phe
        290                295                300

gta tgg gac aag ccg tgg tgg cgc gaa caa ggc ttc tcg ggc gtc ctc     960
Val Trp Asp Lys Pro Trp Trp Arg Glu Gln Gly Phe Ser Gly Val Leu
305                310                315                320

caa tcg agc tcc gac ccc atc tca ttt gcc aga gat acc agc atc gac    1008
Gln Ser Ser Ser Asp Pro Ile Ser Phe Ala Arg Asp Thr Ser Ile Asp
        325                330                335
```

```
gtc gat cga caa tgg tcc att acc tgt ttc atg gtc gga gac ccg gga      1056
Val Asp Arg Gln Trp Ser Ile Thr Cys Phe Met Val Gly Asp Pro Gly
            340                 345                 350

cgg aag tgg tcc caa cag tcc aag cag gta cga caa aag tct gtc tgg      1104
Arg Lys Trp Ser Gln Gln Ser Lys Gln Val Arg Gln Lys Ser Val Trp
            355                 360                 365

gac caa ctc cgc gca gcc tac gag aac gcc ggg gcc caa gtc cca gag      1152
Asp Gln Leu Arg Ala Ala Tyr Glu Asn Ala Gly Ala Gln Val Pro Glu
            370                 375                 380

ccg gcc aac gtg ctc gaa atc gag tgg tcg aag cag cag tat ttc caa      1200
Pro Ala Asn Val Leu Glu Ile Glu Trp Ser Lys Gln Gln Tyr Phe Gln
385                 390                 395                 400

gga gct ccg agc gcc gtc tat ggg ctg aac gat ctc atc aca ctg ggt      1248
Gly Ala Pro Ser Ala Val Tyr Gly Leu Asn Asp Leu Ile Thr Leu Gly
                405                 410                 415

tcg gcg ctc aga acg ccg ttc aag agt gtt cat ttc gtt gga acg gag      1296
Ser Ala Leu Arg Thr Pro Phe Lys Ser Val His Phe Val Gly Thr Glu
            420                 425                 430

acg tct tta gtt tgg aaa ggg tat atg gaa ggg gcc ata cga tcg ggt      1344
Thr Ser Leu Val Trp Lys Gly Tyr Met Glu Gly Ala Ile Arg Ser Gly
            435                 440                 445

caa cga ggt gct gca gaa gtt gtg gct agc ctg gtg cca gca gca tag      1392
Gln Arg Gly Ala Ala Glu Val Val Ala Ser Leu Val Pro Ala Ala  *
            450                 455                 460
```

```
<210> 49
<211> 463
<212> PRT
<213> Unknown

<220>
<223> Cys (-) APAO; removal of cysteine 461

<400> 49
Lys Asp Asn Val Ala Asp Val Val Val Val Gly Ala Gly Leu Ser Gly
1               5                   10                  15
Leu Glu Thr Ala Arg Lys Val Gln Ala Ala Gly Leu Ser Cys Leu Val
            20                  25                  30
Leu Glu Ala Met Asp Arg Val Gly Gly Lys Thr Leu Ser Val Gln Ser
        35                  40                  45
Gly Pro Gly Arg Thr Thr Ile Asn Asp Leu Gly Ala Ala Trp Ile Asn
        50                  55                  60
Asp Ser Asn Gln Ser Glu Val Ser Arg Leu Phe Glu Arg Phe His Leu
65                  70                  75                  80
Glu Gly Glu Leu Gln Arg Thr Thr Gly Asn Ser Ile His Gln Ala Gln
                85                  90                  95
Asp Gly Thr Thr Thr Thr Ala Pro Tyr Gly Asp Ser Leu Leu Ser Glu
            100                 105                 110
Glu Val Ala Ser Ala Leu Ala Glu Leu Leu Pro Val Trp Ser Gln Leu
        115                 120                 125
```

85

```
Ile Glu Glu His Ser Leu Gln Asp Leu Lys Ala Ser Pro Gln Ala Lys
    130                 135                 140
Arg Leu Asp Ser Val Ser Phe Ala His Tyr Cys Glu Lys Glu Leu Asn
145                 150                 155                 160
Leu Pro Ala Val Leu Gly Val Ala Asn Gln Ile Thr Arg Ala Leu Leu
                165                 170                 175
Gly Val Glu Ala His Glu Ile Ser Met Leu Phe Leu Thr Asp Tyr Ile
                180                 185                 190
Lys Ser Ala Thr Gly Leu Ser Asn Ile Phe Ser Asp Lys Lys Asp Gly
        195                 200                 205
Gly Gln Tyr Met Arg Cys Lys Thr Gly Met Gln Ser Ile Cys His Ala
        210                 215                 220
Met Ser Lys Glu Leu Val Pro Gly Ser Val His Leu Asn Thr Pro Val
225                 230                 235                 240
Ala Glu Ile Glu Gln Ser Ala Ser Gly Cys Thr Val Arg Ser Ala Ser
                245                 250                 255
Gly Ala Val Phe Arg Ser Lys Lys Val Val Val Ser Leu Pro Thr Thr
                260                 265                 270
Leu Tyr Pro Thr Leu Thr Phe Ser Pro Pro Leu Pro Ala Glu Lys Gln
        275                 280                 285
Ala Leu Ala Glu Asn Ser Ile Leu Gly Tyr Tyr Ser Lys Ile Val Phe
        290                 295                 300
Val Trp Asp Lys Pro Trp Trp Arg Glu Gln Gly Phe Ser Gly Val Leu
305                 310                 315                 320
Gln Ser Ser Ser Asp Pro Ile Ser Phe Ala Arg Asp Thr Ser Ile Asp
                325                 330                 335
Val Asp Arg Gln Trp Ser Ile Thr Cys Phe Met Val Gly Asp Pro Gly
                340                 345                 350
Arg Lys Trp Ser Gln Gln Ser Lys Gln Val Arg Gln Lys Ser Val Trp
        355                 360                 365
Asp Gln Leu Arg Ala Ala Tyr Glu Asn Ala Gly Ala Gln Val Pro Glu
370                 375                 380
Pro Ala Asn Val Leu Glu Ile Glu Trp Ser Lys Gln Gln Tyr Phe Gln
385                 390                 395                 400
Gly Ala Pro Ser Ala Val Tyr Gly Leu Asn Asp Leu Ile Thr Leu Gly
                405                 410                 415
Ser Ala Leu Arg Thr Pro Phe Lys Ser Val His Phe Val Gly Thr Glu
                420                 425                 430
Thr Ser Leu Val Trp Lys Gly Tyr Met Glu Gly Ala Ile Arg Ser Gly
        435                 440                 445
Gln Arg Gly Ala Ala Glu Val Val Ala Ser Leu Val Pro Ala Ala
    450                 455                 460
```

```
aaa gac aac gtt gcg gac gtg gta gtg gtg ggc gct ggc ttg agc ggt    48
Lys Asp Asn Val Ala Asp Val Val Val Val Gly Ala Gly Leu Ser Gly
 1               5                   10                  15
```

```
ttg gag acg gca cgc aaa gtc cag gcc gcc ggt ctg tcc tgc ctc gtt        96
Leu Glu Thr Ala Arg Lys Val Gln Ala Ala Gly Leu Ser Cys Leu Val
            20                  25                  30

ctt gag gcg atg gat cgt gta ggg gga aag act ctg agc gta caa tcg       144
Leu Glu Ala Met Asp Arg Val Gly Gly Lys Thr Leu Ser Val Gln Ser
            35                  40                  45

ggt ccc ggc agg acg act atc aac gac ctc ggc gct gcg tgg atc aat       192
Gly Pro Gly Arg Thr Thr Ile Asn Asp Leu Gly Ala Ala Trp Ile Asn
        50                  55                  60

gac agc aac caa agc gaa gta tcc aga ttg ttt gaa aga ttt cat ttg       240
Asp Ser Asn Gln Ser Glu Val Ser Arg Leu Phe Glu Arg Phe His Leu
65                  70                  75                  80

gag ggc gag ctc cag agg acg act gga aat tca atc cat caa gca caa       288
Glu Gly Glu Leu Gln Arg Thr Thr Gly Asn Ser Ile His Gln Ala Gln
                85                  90                  95

gac ggt aca acc act aca gct cct tat ggt gac tcc ttg ctg agc gag      336
Asp Gly Thr Thr Thr Thr Ala Pro Tyr Gly Asp Ser Leu Leu Ser Glu
            100                 105                 110

gag gtt gca agt gca ctt gcg gaa ctc ctc ccc gta tgg tct cag ctg      384
Glu Val Ala Ser Ala Leu Ala Glu Leu Leu Pro Val Trp Ser Gln Leu
            115                 120                 125

atc gaa gag cat agc ctt caa gac ctc aag gcg agc cct cag gcg aag      432
Ile Glu Glu His Ser Leu Gln Asp Leu Lys Ala Ser Pro Gln Ala Lys
        130                 135                 140

cgg ctc gac agt gtg agc ttc gcg cac tac tgt gag aag gaa cta aac      480
Arg Leu Asp Ser Val Ser Phe Ala His Tyr Cys Glu Lys Glu Leu Asn
145                 150                 155                 160

ttg cct gct gtt ctc ggc gta gca aac cag atc aca cgc gct ctg ctc      528
Leu Pro Ala Val Leu Gly Val Ala Asn Gln Ile Thr Arg Ala Leu Leu
                165                 170                 175

ggt gtg gaa gcc cac gag atc agc atg ctt ttt ctc acc gac tac atc      576
Gly Val Glu Ala His Glu Ile Ser Met Leu Phe Leu Thr Asp Tyr Ile
            180                 185                 190

aag agt gcc acc ggt ctc agt aat att ttc tcg gac aag aaa gac ggc      624
Lys Ser Ala Thr Gly Leu Ser Asn Ile Phe Ser Asp Lys Lys Asp Gly
            195                 200                 205

ggg cag tat atg cga tgc aaa aca ggt atg cag tcg att tcg cat gcc      672
Gly Gln Tyr Met Arg Cys Lys Thr Gly Met Gln Ser Ile Ser His Ala
        210                 215                 220

atg tca aag gaa ctt gtt cca ggc tca gtg cac ctc aac acc ccc gtc      720
Met Ser Lys Glu Leu Val Pro Gly Ser Val His Leu Asn Thr Pro Val
225                 230                 235                 240

gct gaa att gag cag tcg gca tcc ggc tgt aca gta cga tcg gcc tcg      768
```

87

```
Ala Glu Ile Glu Gln Ser Ala Ser Gly Cys Thr Val Arg Ser Ala Ser
            245                 250                 255

ggc gcc gtg ttc cga agc aaa aag gtg gtg gtt tcg tta ccg aca acc        816
Gly Ala Val Phe Arg Ser Lys Lys Val Val Val Ser Leu Pro Thr Thr
            260                 265                 270

ttg tat ccc acc ttg aca ttt tca cca cct ctt ccc gcc gag aag caa        864
Leu Tyr Pro Thr Leu Thr Phe Ser Pro Pro Leu Pro Ala Glu Lys Gln
            275                 280                 285

gca ttg gcg gaa aat tct atc ctg ggc tac tat agc aag ata gtc ttc        912
Ala Leu Ala Glu Asn Ser Ile Leu Gly Tyr Tyr Ser Lys Ile Val Phe
            290                 295                 300

gta tgg gac aag ccg tgg tgg cgc gaa caa ggc ttc tcg ggc gtc ctc        960
Val Trp Asp Lys Pro Trp Trp Arg Glu Gln Gly Phe Ser Gly Val Leu
305                 310                 315                 320

caa tcg agc tcc gac ccc atc tca ttt gcc aga gat acc agc atc gac       1008
Gln Ser Ser Ser Asp Pro Ile Ser Phe Ala Arg Asp Thr Ser Ile Asp
                325                 330                 335

gtc gat cga caa tgg tcc att acc tgt ttc atg gtc gga gac ccg gga       1056
Val Asp Arg Gln Trp Ser Ile Thr Cys Phe Met Val Gly Asp Pro Gly
                340                 345                 350

cgg aag tgg tcc caa cag tcc aag cag gta cga caa aag tct gtc tgg       1104
Arg Lys Trp Ser Gln Gln Ser Lys Gln Val Arg Gln Lys Ser Val Trp
            355                 360                 365

gac caa ctc cgc gca gcc tac gag aac gcc ggg gcc caa gtc cca gag       1152
Asp Gln Leu Arg Ala Ala Tyr Glu Asn Ala Gly Ala Gln Val Pro Glu
            370                 375                 380

ccg gcc aac gtg ctc gaa atc gag tgg tcg aag cag cag tat ttc caa       1200
Pro Ala Asn Val Leu Glu Ile Glu Trp Ser Lys Gln Gln Tyr Phe Gln
385                 390                 395                 400

gga gct ccg agc gcc gtc tat ggg ctg aac gat ctc atc aca ctg ggt       1248
Gly Ala Pro Ser Ala Val Tyr Gly Leu Asn Asp Leu Ile Thr Leu Gly
                405                 410                 415

tcg gcg ctc aga acg ccg ttc aag agt gtt cat ttc gtt gga acg gag       1296
Ser Ala Leu Arg Thr Pro Phe Lys Ser Val His Phe Val Gly Thr Glu
            420                 425                 430

acg tct tta gtt tgg aaa ggg tat atg gaa ggg gcc ata cga tcg ggt       1344
Thr Ser Leu Val Trp Lys Gly Tyr Met Glu Gly Ala Ile Arg Ser Gly
            435                 440                 445

caa cga ggt gct gca gaa gtt gtg gct agc ctg gtg cca gca gca tag       1392
Gln Arg Gly Ala Ala Glu Val Val Ala Ser Leu Val Pro Ala Ala  *
            450                 455                 460
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<210> 51
<211> 463

88

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<212> PRT
<213> Unknown

<220>
<223> Cys (-) APAO; removal of cysteines 359 and 461

<400> 51
Lys Asp Asn Val Ala Asp Val Val Val Gly Ala Gly Leu Ser Gly
1               5                   10                  15
Leu Glu Thr Ala Arg Lys Val Gln Ala Ala Gly Leu Ser Cys Leu Val
            20                  25                  30
Leu Glu Ala Met Asp Arg Val Gly Gly Lys Thr Leu Ser Val Gln Ser
        35                  40                  45
Gly Pro Gly Arg Thr Thr Ile Asn Asp Leu Gly Ala Ala Trp Ile Asn
    50                  55                  60
Asp Ser Asn Gln Ser Glu Val Ser Arg Leu Phe Glu Arg Phe His Leu
65                  70                  75                  80
Glu Gly Glu Leu Gln Arg Thr Thr Gly Asn Ser Ile His Gln Ala Gln
                85                  90                  95
Asp Gly Thr Thr Thr Thr Ala Pro Tyr Gly Asp Ser Leu Leu Ser Glu
            100                 105                 110
Glu Val Ala Ser Ala Leu Ala Glu Leu Leu Pro Val Trp Ser Gln Leu
            115                 120                 125
Ile Glu Glu His Ser Leu Gln Asp Leu Lys Ala Ser Pro Gln Ala Lys
    130                 135                 140
Arg Leu Asp Ser Val Ser Phe Ala His Tyr Cys Glu Lys Glu Leu Asn
145                 150                 155                 160
Leu Pro Ala Val Leu Gly Val Ala Asn Gln Ile Thr Arg Ala Leu Leu
                165                 170                 175
Gly Val Glu Ala His Glu Ile Ser Met Leu Phe Leu Thr Asp Tyr Ile
            180                 185                 190
Lys Ser Ala Thr Gly Leu Ser Asn Ile Phe Ser Asp Lys Lys Asp Gly
            195                 200                 205
Gly Gln Tyr Met Arg Cys Lys Thr Gly Met Gln Ser Ile Ser His Ala
    210                 215                 220
Met Ser Lys Glu Leu Val Pro Gly Ser Val His Leu Asn Thr Pro Val
225                 230                 235                 240
Ala Glu Ile Glu Gln Ser Ala Ser Gly Cys Thr Val Arg Ser Ala Ser
                245                 250                 255
Gly Ala Val Phe Arg Ser Lys Lys Val Val Val Ser Leu Pro Thr Thr
            260                 265                 270
Leu Tyr Pro Thr Leu Thr Phe Ser Pro Pro Leu Pro Ala Glu Lys Gln
    275                 280                 285
Ala Leu Ala Glu Asn Ser Ile Leu Gly Tyr Tyr Ser Lys Ile Val Phe
    290                 295                 300
Val Trp Asp Lys Pro Trp Trp Arg Glu Gln Gly Phe Ser Gly Val Leu
305                 310                 315                 320
Gln Ser Ser Ser Asp Pro Ile Ser Phe Ala Arg Asp Thr Ser Ile Asp
            325                 330                 335
Val Asp Arg Gln Trp Ser Ile Thr Cys Phe Met Val Gly Asp Pro Gly
            340                 345                 350
Arg Lys Trp Ser Gln Gln Ser Lys Gln Val Arg Gln Lys Ser Val Trp
            355                 360                 365
Asp Gln Leu Arg Ala Ala Tyr Glu Asn Ala Gly Ala Gln Val Pro Glu
    370                 375                 380
Pro Ala Asn Val Leu Glu Ile Glu Trp Ser Lys Gln Gln Tyr Phe Gln
385                 390                 395                 400
Gly Ala Pro Ser Ala Val Tyr Gly Leu Asn Asp Leu Ile Thr Leu Gly
                        89
```

```
                    405                    410                    415
Ser Ala Leu Arg Thr Pro Phe Lys Ser Val His Phe Val Gly Thr Glu
            420                    425                    430
Thr Ser Leu Val Trp Lys Gly Tyr Met Glu Gly Ala Ile Arg Ser Gly
        435                    440                    445
Gln Arg Gly Ala Ala Glu Val Val Ala Ser Leu Val Pro Ala Ala
    450                    455                    460


        <210> 52
        <211> 1392
        <212> DNA
        <213> Unknown

        <220>
        <221> CDS
        <222> (1)...(1392)

        <223> Cys (-) APAO; removal of cysteines 169, 359, and
              461


        <400> 52
aaa gac aac gtt gcg gac gtg gta gtg gtg ggc gct ggc ttg agc ggt      48
Lys Asp Asn Val Ala Asp Val Val Val Val Gly Ala Gly Leu Ser Gly
1               5                   10                  15


ttg gag acg gca cgc aaa gtc cag gcc gcc ggt ctg agc tcc ctc gtt      96
Leu Glu Thr Ala Arg Lys Val Gln Ala Ala Gly Leu Ser Ser Leu Val
            20                  25                  30


ctt gag gcg atg gat cgt gta ggg gga aag act ctg agc gta caa tcg     144
Leu Glu Ala Met Asp Arg Val Gly Gly Lys Thr Leu Ser Val Gln Ser
        35                  40                  45


ggt ccc ggc agg acg act atc aac gac ctc ggc gct gcg tgg atc aat     192
Gly Pro Gly Arg Thr Thr Ile Asn Asp Leu Gly Ala Ala Trp Ile Asn
    50                  55                  60


gac agc aac caa agc gaa gta tcc aga ttg ttt gaa aga ttt cat ttg     240
Asp Ser Asn Gln Ser Glu Val Ser Arg Leu Phe Glu Arg Phe His Leu
65                  70                  75                  80


gag ggc gag ctc cag agg acg act gga aat tca atc cat caa gca caa     288
Glu Gly Glu Leu Gln Arg Thr Thr Gly Asn Ser Ile His Gln Ala Gln
                85                  90                  95


gac ggt aca acc act aca gct cct tat ggt gac tcc ttg ctg agc gag     336
Asp Gly Thr Thr Thr Thr Ala Pro Tyr Gly Asp Ser Leu Leu Ser Glu
            100                 105                 110


gag gtt gca agt gca ctt gcg gaa ctc ctc ccc gta tgg tct cag ctg     384
Glu Val Ala Ser Ala Leu Ala Glu Leu Leu Pro Val Trp Ser Gln Leu
        115                 120                 125


atc gaa gag cat agc ctt caa gac ctc aag gcg agc cct cag gcg aag     432
Ile Glu Glu His Ser Leu Gln Asp Leu Lys Ala Ser Pro Gln Ala Lys
    130                 135                 140


cgg ctc gac agt gtg agc ttc gcg cac tac tgt gag aag gaa cta aac     480
```
90

```
Arg Leu Asp Ser Val Ser Phe Ala His Tyr Cys Glu Lys Glu Leu Asn
145                 150                 155                 160


ttg cct gct gtt ctc ggc gta gca aac cag atc aca cgc gct ctg ctc    528
Leu Pro Ala Val Leu Gly Val Ala Asn Gln Ile Thr Arg Ala Leu Leu
                    165                 170                 175


ggt gtg gaa gcc cac gag atc agc atg ctt ttt ctc acc gac tac atc    576
Gly Val Glu Ala His Glu Ile Ser Met Leu Phe Leu Thr Asp Tyr Ile
                180                 185                 190


aag agt gcc acc ggt ctc agt aat att ttc tcg gac aag aaa gac ggc    624
Lys Ser Ala Thr Gly Leu Ser Asn Ile Phe Ser Asp Lys Lys Asp Gly
                195                 200                 205


ggg cag tat atg cga tgc aaa aca ggt atg cag tcg att tcg cat gcc    672
Gly Gln Tyr Met Arg Cys Lys Thr Gly Met Gln Ser Ile Ser His Ala
            210                 215                 220


atg tca aag gaa ctt gtt cca ggc tca gtg cac ctc aac acc ccc gtc    720
Met Ser Lys Glu Leu Val Pro Gly Ser Val His Leu Asn Thr Pro Val
225                 230                 235                 240


gct gaa att gag cag tcg gca tcc ggc tgt aca gta cga tcg gcc tcg    768
Ala Glu Ile Glu Gln Ser Ala Ser Gly Cys Thr Val Arg Ser Ala Ser
                    245                 250                 255


ggc gcc gtg ttc cga agc aaa aag gtg gtg gtt tcg tta ccg aca acc    816
Gly Ala Val Phe Arg Ser Lys Lys Val Val Val Ser Leu Pro Thr Thr
                260                 265                 270


ttg tat ccc acc ttg aca ttt tca cca cct ctt ccc gcc gag aag caa    864
Leu Tyr Pro Thr Leu Thr Phe Ser Pro Pro Leu Pro Ala Glu Lys Gln
            275                 280                 285


gca ttg gcg gaa aat tct atc ctg ggc tac tat agc aag ata gtc ttc    912
Ala Leu Ala Glu Asn Ser Ile Leu Gly Tyr Tyr Ser Lys Ile Val Phe
            290                 295                 300


gta tgg gac aag ccg tgg tgg cgc gaa caa ggc ttc tcg ggc gtc ctc    960
Val Trp Asp Lys Pro Trp Trp Arg Glu Gln Gly Phe Ser Gly Val Leu
305                 310                 315                 320


caa tcg agc tcc gac ccc atc tca ttt gcc aga gat acc agc atc gac   1008
Gln Ser Ser Ser Asp Pro Ile Ser Phe Ala Arg Asp Thr Ser Ile Asp
                325                 330                 335


gtc gat cga caa tgg tcc att acc tgt ttc atg gtc gga gac ccg gga   1056
Val Asp Arg Gln Trp Ser Ile Thr Cys Phe Met Val Gly Asp Pro Gly
            340                 345                 350


cgg aag tgg tcc caa cag tcc aag cag gta cga caa aag tct gtc tgg   1104
Arg Lys Trp Ser Gln Gln Ser Lys Gln Val Arg Gln Lys Ser Val Trp
            355                 360                 365


gac caa ctc cgc gca gcc tac gag aac gcc ggg gcc caa gtc cca gag   1152
Asp Gln Leu Arg Ala Ala Tyr Glu Asn Ala Gly Ala Gln Val Pro Glu
            370                 375                 380
```

91

```
ccg gcc aac gtg ctc gaa atc gag tgg tcg aag cag cag tat ttc caa      1200
Pro Ala Asn Val Leu Glu Ile Glu Trp Ser Lys Gln Gln Tyr Phe Gln
385                 390                 395                 400

gga gct ccg agc gcc gtc tat ggg ctg aac gat ctc atc aca ctg ggt      1248
Gly Ala Pro Ser Ala Val Tyr Gly Leu Asn Asp Leu Ile Thr Leu Gly
                405                 410                 415

tcg gcg ctc aga acg ccg ttc aag agt gtt cat ttc gtt gga acg gag      1296
Ser Ala Leu Arg Thr Pro Phe Lys Ser Val His Phe Val Gly Thr Glu
                420                 425                 430

acg tct tta gtt tgg aaa ggg tat atg gaa ggg gcc ata cga tcg ggt      1344
Thr Ser Leu Val Trp Lys Gly Tyr Met Glu Gly Ala Ile Arg Ser Gly
                435                 440                 445

caa cga ggt gct gca gaa gtt gtg gct agc ctg gtg cca gca gca tag      1392
Gln Arg Gly Ala Ala Glu Val Val Ala Ser Leu Val Pro Ala Ala  *
450                 455                 460


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Leu Glu Thr Ala Arg Lys Val Gln Ala Ala Gly Leu Ser Ser Leu Val
            20              25                  30
Leu Glu Ala Met Asp Arg Val Gly Gly Lys Thr Leu Ser Val Gln Ser
        35              40                  45
Gly Pro Gly Arg Thr Thr Ile Asn Asp Leu Gly Ala Ala Trp Ile Asn
    50              55                  60
Asp Ser Asn Gln Ser Glu Val Ser Arg Leu Phe Glu Arg Phe His Leu
65              70                  75                  80
Glu Gly Glu Leu Gln Arg Thr Thr Gly Asn Ser Ile His Gln Ala Gln
            85                  90                  95
Asp Gly Thr Thr Thr Thr Ala Pro Tyr Gly Asp Ser Leu Leu Ser Glu
            100                 105                 110
Glu Val Ala Ser Ala Leu Ala Glu Leu Leu Pro Val Trp Ser Gln Leu
    115                 120                 125
Ile Glu Glu His Ser Leu Gln Asp Leu Lys Ala Ser Pro Gln Ala Lys
    130                 135                 140
Arg Leu Asp Ser Val Ser Phe Ala His Tyr Cys Glu Lys Glu Leu Asn
145                 150                 155                 160
Leu Pro Ala Val Leu Gly Val Ala Asn Gln Ile Thr Arg Ala Leu Leu
                165                 170                 175
Gly Val Glu Ala His Glu Ile Ser Met Leu Phe Leu Thr Asp Tyr Ile
                180                 185                 190
Lys Ser Ala Thr Gly Leu Ser Asn Ile Phe Ser Asp Lys Lys Asp Gly
                195                 200                 205
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                                          92

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Gly Gln Tyr Met Arg Cys Lys Thr Gly Met Gln Ser Ile Ser His Ala
    210                 215                 220
Met Ser Lys Glu Leu Val Pro Gly Ser Val His Leu Asn Thr Pro Val
225                 230                 235                 240
Ala Glu Ile Glu Gln Ser Ala Ser Gly Cys Thr Val Arg Ser Ala Ser
                245                 250                 255
Gly Ala Val Phe Arg Ser Lys Lys Val Val Val Ser Leu Pro Thr Thr
                260                 265                 270
Leu Tyr Pro Thr Leu Thr Phe Ser Pro Pro Leu Pro Ala Glu Lys Gln
            275                 280                 285
Ala Leu Ala Glu Asn Ser Ile Leu Gly Tyr Tyr Ser Lys Ile Val Phe
    290                 295                 300
Val Trp Asp Lys Pro Trp Trp Arg Glu Gln Gly Phe Ser Gly Val Leu
305                 310                 315                 320
Gln Ser Ser Ser Asp Pro Ile Ser Phe Ala Arg Asp Thr Ser Ile Asp
                325                 330                 335
Val Asp Arg Gln Trp Ser Ile Thr Cys Phe Met Val Gly Asp Pro Gly
            340                 345                 350
Arg Lys Trp Ser Gln Gln Ser Lys Gln Val Arg Gln Lys Ser Val Trp
            355                 360                 365
Asp Gln Leu Arg Ala Ala Tyr Glu Asn Ala Gly Ala Gln Val Pro Glu
    370                 375                 380
Pro Ala Asn Val Leu Glu Ile Glu Trp Ser Lys Gln Gln Tyr Phe Gln
385                 390                 395                 400
Gly Ala Pro Ser Ala Val Tyr Gly Leu Asn Asp Leu Ile Thr Leu Gly
                405                 410                 415
Ser Ala Leu Arg Thr Pro Phe Lys Ser Val His Phe Val Gly Thr Glu
                420                 425                 430
Thr Ser Leu Val Trp Lys Gly Tyr Met Glu Gly Ala Ile Arg Ser Gly
            435                 440                 445
Gln Arg Gly Ala Ala Glu Val Val Ala Ser Leu Val Pro Ala Ala
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Gly Gly Gly Ser Gly Gly Gly Ser
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Asp Val Val Val Val Gly Ala Gly Leu Ser Gly
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93